

THE Malayan Agricultural Journal.

Edited by the Agricultural Economist with the assistance of
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THE
Malayan Agricultural Journal.

JANUARY, 1939

EDITORIAL.

**The Future
for Derris.**

During the past year the Department of Agriculture has received a number of enquiries from local planters of derris regarding the marketing of their crop, and we must admit that efforts to place buyer and seller in touch have by no means inevitably resulted in satisfactory business. The local shipper is, of course, guided by the demand from his buyer in the United Kingdom, America, or elsewhere, and the lack of interest in derris which these buyers have evinced in recent months has curtailed the business of our exporters, and in some cases, left the grower with unsold stocks.

Writing editorially on this subject a year ago, we pointed out that with the greatly increased acreage planted during the past year or so, the market—as yet a small one—may become overstocked, with a consequent lowering of the price level, and we added, that with increasing stocks on the market, the buyer will become more discriminating as to the quality of the product he purchases.

The fact that subsequent events have shown this view of the subject to be justified is no source of satisfaction to the writer, but the failure of derris to hold its position in the market appears to have been due more to price competition with a product possessing similar toxic qualities—cube—than to the increased production of derris. It must be admitted, however, that the poor reputation in the past of Malayan derris prejudiced the sale of this product, and in order to dispel this prejudice it is essential that the endeavours which have been made in recent years to popularize the cultivation in Malaya of derris of proven quality be continued and the low quality root ultimately eliminated from the market.

The doubt has been expressed as to whether a market exists in America for root of very high concentration of rotenone at a price commensurate with its toxic content, for the reason that such root presents practical difficulties in its application as an insecticide. The effect of this objection is to prejudice Malayan derris root of high rotenone content, and this raises the question as to whether it is desirable to plant proven high quality material, such as *Derris elliptica*, Changi No. 3, or another variety which gives higher yields of root than Changi No. 3 and has a content of toxic constituents which is fully adequate to satisfy market demands. While the solution of this problem is subject to the results of investigations now in

hand, it may well be that the safest course will be to plant equal areas of Changi No. 3 and "Sarawak creeping," a policy which might lower cost of production by reason of higher yields from the latter variety, and the maintenance of quality to the present required standard.

The complexities of the situation, the doubt which has existed as to the planting policy to be adopted, and the uncertainties of the future, fully justified the visit to the United States of America of Major C. D. V. Georgi, O.B.E., of this Department, and the article which he contributes to this number will be read with interest by those of our readers who are interested in the cultivation or marketing of this crop.

Major Georgi's visit to America has been fruitful in many respects, in particular because it has brought this Department more personally in touch with the American market, and has enabled the Department to review the whole question with the ultimate object of supplying the class of product which will be most acceptable to the trade. As a direct result of this visit, we receive regular information from New York concerning the position of the market, which we pass to our readers through our "Market Prices."

The present prospects for Malayan derris in the United States are not encouraging, and the future is difficult to foresee. Our personal opinion is that the present tendency to employ plant insecticides in place of arsenical insecticides will gain in popularity, but whether derris will be able to maintain its position in competition with cube is less certain. We believe, however, that if our producers are able to market a standardized product at a price at which it can compete with cube—and this should not be impossible—Malayan derris can be established in the market. In the past, the market for derris has been prejudiced by the wide variation in quality, and by lack of knowledge in consuming countries of the fact that derris, as marketed to-day, is not a jungle product, but a plantation crop, and that as a result of investigations by this Department, cultivators can now produce a high-grade product, in every way suitable for the requirements of the market.

We believe that Major Georgi's visit to America, and the contacts which he has made with business men in that country, will be fruitful by increasing confidence in the purchase of Malayan derris.

Original Articles.

THE OUTLOOK FOR MALAYAN DERRIS IN THE UNITED STATES OF AMERICA

By
C. D. V. GEORGI,
Senior Chemist.

Introductory.

A large amount of selection work on derris has been carried out in recent years by the Department with the object of developing strains of plants with roots of a high toxic content, thereby eliminating to a large extent the variability in quality of commercial consignments of root.

The work has been attended with a certain amount of success, strains of plants of *Derris elliptica*, Changi No. 3, having been isolated in which the rotenone content, calculated on a moisture-free basis, is of the order of 12 per cent. The figure for the ether extract on a similar basis lies between 25 and 30 per cent.

In the early part of last year when the writer proceeded on long leave, permission was granted him to travel via America to discuss the results of this selection work with officers of the United States Department of Agriculture and with representatives of insecticide firms in New York. At the same time, opportunity was taken to collect information regarding the position of derris in relation to the other plant insecticide with which it competes, namely cube.

The present paper is a summary of a detailed report already submitted to Government. Mention is made, however, of the organization established recently in the United Kingdom for co-ordinating the results of research work on insecticide materials of vegetable origin being carried out in various parts of the British Empire.

Sources of Supply of Cube Root.

Cube (pronounced koobay) is the trade term applied to roots of various species of the genus *Lonchocarpus*, which is found widely distributed in the tropical parts of South and Central America.

Similarly to derris in Malaya, cube has been used from time immemorial by the South American Indians for fishing purposes. Plants were grown clandestinely, their cultivation in certain areas being prohibited by law owing to the detrimental effect of an increasing use of the root on the fish population of the rivers.

The discovery by Clark⁽¹⁾ of rotenone in cube root drew the attention of the insecticide manufacturers to the potential value of this root as a further source of supply of raw material.

The possibility of establishing a new industry also caused a change in the official attitude, campaigns being started to interest cultivators in this crop. These campaigns were highly successful, large areas both in Brazil and Peru having been

planted in recent years. In this connexion it may be mentioned that in Peru the cultivation and industrial exploitation of plants belonging to the genus *Lonchocarpus* has been declared by Presidential Decree to be of public utility.

At the present time Brazil is the principal country of export, being followed by Peru. Smaller quantities of the roots are exported from Venezuela and Colombia, while it is understood that if there is a marked increase in the use of cube, Nicaragua is considering the possibility of developing a local industry.

It may be of interest to record that while cube is the trade term, the root is known as "timbo" in Brazil, "barbasco" in Peru and "haiari" in British Guiana.

Similarly to derris, wide variations have been found in the toxic contents of the roots of the various species of *Lonchocarpus*. With the objects of developing strains of high quality plants and reducing such variation to a minimum, selection work on similar lines to that being carried out on derris by this Department has been initiated in Peru.

Stringent regulations having for their object the prevention of the export of viable material are a feature of the cube industry at present. For example, in Peru, the export of *lonchocarpus* cuttings is prohibited. Further, with the object of preventing even the root from being used as a source of supply of planting material, all root exported must be despatched in an air-dry state, say 8 to 10 per cent. moisture. In Brazil, the export of whole root, even though dried, is only allowed by special permit, the bulk of the root being shipped in a ground state. Such root is referred to in the returns issued by the United States Department of Commerce as "Root, advanced in value." Root imported into the United States in this condition is subject to a 10 per cent. *ad valorem* duty. This duty would also be applicable to ground derris root.

Two reasons were adduced for these stringent precautions; the possibility of a vast increase in the cube industry if means are found to replace arsenical insecticides by plant insecticides of this type, and the prevention of the establishment of a major agricultural industry in other parts of the world on plantation lines, such as occurred in the case of the plantation rubber industry.

While it is not suggested that the plant insecticide industry will ever rival the plantation rubber industry in importance, there is no doubt that if this replacement is successfully accomplished the cube industry in Brazil and Peru will become of major importance and will doubtless be closely guarded, having regard to the nationalistic tendency prevailing throughout the world at the present time.

Trade in Derris and Cube Roots.

Table I gives the amounts of derris and cube roots, together with their countries of origin and declared values, imported into the United States during the years 1936, 1937 and the first half of 1938.

Small amounts of roots in transshipment from other countries to the United States have been omitted from the table; they do not affect the figures to any appreciable extent.

Table I

Imports of Derris and Cube Roots into the United States for 1936,
1937 and First Half of 1938.

Description of Root	Country of Origin	1936		1937		1938 (January to June)	
		Amount	Value	Amount	Value	Amount	Value
Derris, Crude	Malaya	lbs. 332,251	\$ 69,182	lbs. 401,975	\$ 72,613	lbs. 122,746	\$ 16,480
	Netherlands Indies	28,581	5,145	57,524	10,609	62,710	8,797
	Philippine Islands	149,505	21,626	110,528	14,046	19,497	2,640
	Other Sources	...	...	368	74	...	...
	TOTAL	510,337	95,953	570,395	97,342	204,953	27,917
Cube, Crude	Brazil	508,570	34,044	197,892	16,677	25,744	1,476
	Peru	171,600	19,350	378,259	34,487	213,444	14,075
	Venezuela	22,750	1,775	...	...	...	...
	Colombia	1,200	156	...	...	...	...
	TOTAL	704,120	55,325	576,151	51,164	239,188	15,551
Cube, Advanced in Value	Brazil	1,124,936	172,239	1,263,773	190,844	1,268,337	181,439
Cube	GRAND TOTAL	1,829,056	227,564	1,839,924	242,008	1,507,525	196,990

The figures show a steadily growing popularity of cube compared with derris. Thus during the years 1936 and 1937 between three and four pounds of cube were imported for every pound of derris, but during the first half of 1938 this amount of cube rose to more than seven pounds.

The steadily increasing proportion of ground cube root compared with the total amount imported is noticeable. Thus in 1936 the proportion was 61.5 per cent., increasing in 1937 to 68.7 per cent. and in the first half of 1938 to 84.1 per cent.

With regard to the figures for derris, the decreasing exports from the Philippine Islands and the gradually increasing exports from Netherlands Indies are of interest. In the case of the Philippine Islands product it was stated that the decreasing importance of the trade was to a large extent due to marked variability in quality of the root.

Quality of Products.

Importers are still complaining of the variation in quality of Malayan derris. Consignments of root guaranteed to contain a minimum of say 5 per cent. rotenone are found to be deficient on analysis. The sample for analysis is drawn not from the bales of root but from the powder resulting from the grinding of a proportion of the bales, say 10 per cent., taken at random from the consignment. Sampling errors are thereby reduced to a minimum.

Two explanations suggest themselves for this somewhat disturbing contention. It is more than likely that with the high prices prevailing a few years ago for derris cuttings on account of the greatly increased planted area and the cultivators' lack of knowledge regarding proven material, some of the newly-opened areas were planted with cuttings from stock poor in rotenone, for example *D. malaccensis* plants from the Kinta District or even low grade *D. elliptica* plants of which there is ample evidence of being established in various parts of the country.

From the point of view of the native cultivator, rotenone is a comparatively recent introduction as a factor of importance in disposing of a crop of derris. It may well be, therefore, that unless such a cultivator has taken the trouble to verify the origin of his stock, the rotenone content may vary widely from generation to generation. It will be dependent to a large extent on that of the strongest growing plants since it is from such plants that a cultivator is likely to select his cuttings.

It is also felt that the absence to-date of a definite correlation between quality of root and price may be a contributory cause of this variation. For example, cases have occurred in which dealers who have sold root on a 5 per cent. rotenone basis, have suffered a deduction in price because the rotenone content on sampling and analysis has been found to be less than the amount specified, but they have not received a corresponding premium when the rotenone content of the consignment is in excess of the contract. Such a procedure is always calculated to induce the dealer to scale down his product to the minimum and to take a chance that the deficiency, if any, will not be discovered.

The remedy lies, therefore, in ensuring that both estates and small producers plant only material of proved high toxic content and propagate further stocks from that material alone. In the case of the small producer, a buying organization dealing only in such high quality root would also be necessary to ensure his receiving a fair price for his product.

With increasing quantities of high quality root coming forward, the industry will be in a much stronger position to insist upon the establishment of a price basis in which quality of root would receive its just reward. With the changed conditions the possibility of derris root of low and even moderate toxic content, for example, *D. malaccensis* from the Kinta District, being used only as a diluent or actually becoming unsaleable, unless such root was found to be a specific against a certain insect, must not be overlooked. The use of the root as a diluent will be referred to later.

As regards cube root, both Brazil and Peru appear to have profited by the experience of Malaya in this respect and to have paid considerable attention to the question of the maintenance of a standard quality of product.

Brazilian powdered root is said to average about 5 per cent. rotenone with a total of 22 per cent. ether extract. It is understood that this is not a whole ground root but a sieved product from which the fibrous portion of the whole root is excluded. Since the fibrous portion is low in toxic content the sieved product will be higher both in rotenone and ether extract than the whole root.

The powdered root is packed in sealed barrels or cases and each consignment is accompanied by a certificate of analysis.

It would appear that the milling of cube root in Brazil is practically a monopoly. This, together with the fact that the root is powdered, thereby making blending of material a comparatively simple process, facilitates the shipment of a uniform product.

At present only whole root is exported from Peru. There are two grades, the higher quality averaging 5 per cent. rotenone with 16 per cent. total ether extract and the lower grade 4 per cent. rotenone with 14 per cent. total ether extract. Attention has been drawn previously to the selection work initiated in Peru with the object of isolating plants with roots of high toxic content for propagating purposes.

It is interesting to note that all cube root from Peru is exported via the River Amazon and Brazil, the Andes forming a barrier to the export of the material from the western seaboard of that country.

The general impression is that with any marked increase in the use of cube, mills will be erected in Peru, thus bringing that country into line with Brazil.

Derris and Cube as Insecticides.

The New York insecticide manufacturers are still inclined to regard rotenone as the criterion of insecticidal value, the ether extract being considered of somewhat secondary importance.

This seems to be due to the fact that in the control of the three major agricultural pests against which both derris and cube are used, the pea aphid, the Mexican bean beetle and three species of cabbage worms, the rate of application has been standardized on a rotenone basis. Further, both laboratory and field tests have shown cube to be equally effective as derris of the same rotenone content.

This view is not taken by the Food and Drug Administration of the Department of Agriculture who regard the ether extract as of primary importance. For example, they require only the total amount of either derris or cube resins, that is the total amount of ether extract, to be entered on the label of a derris or cube insecticide for sale.

A specimen of an acceptable label is as follows:—

		per cent.
ACTIVE INGREDIENT		
Derris resins	...	—
INERT INGREDIENTS	...	—
		<hr/>
TOTAL	...	100.00

The rotenone content may, however, be entered on the label. Such a practice is optional. In such cases the label would read

		per cent.
ACTIVE INGREDIENTS		
Rotenone	...	—
Other Cube Resins	...	—
INERT INGREDIENTS	...	—
		<hr/>
TOTAL	...	100.00

The question of the relative toxicities of rotenone and ether extractives other than rotenone is still unsettled. There is a feeling that the ether extractives other than rotenone in derris are either more toxic or more repellant than those in cube but there is no scientific evidence to support it. The general opinion is that a definite statement regarding the relative toxicities of derris and cube must be postponed until the results of tests with accurately analysed samples of the same particle size against a number of species of insects are available.

The analytical aspect is stressed because if rotenone is such a strong insecticide compared with other ether extractives, it is essential to determine the percentage with a high degree of accuracy, also to be able to separate it completely from the other extractives, thereby allowing a fair comparison of insecticidal values to be made. At present, the method for the estimation of rotenone, more particularly in derris root, is not characterised by the high degree of accuracy usually associated with quantitative analysis. Workers in various countries are actively engaged in endeavouring to improve the method and to arrive eventually at a standard method to be used when assaying the root.

As far as could be ascertained, this difficulty of complete separation of rotenone from the other extractives does not arise to the same extent in the case of cube root.

Similarly, the particle size must be emphasized. It is stated that the derris powder milled in the United States is of a finer particle size than the powdered cube root imported from Brazil, in which case the apparent superiority of derris over cube towards a certain insect may be due to this cause.

Prices of Derris and Cube.

The present preference shown for cube is due to the fact that it is offered at a lower price than derris of the same rotenone content. Cube is therefore the more economical insecticide to use against those major agricultural pests to which reference has already been made.

At the time of the writer's visit to New York (April 1938) the current prices for root of 5 per cent. rotenone content were about 14 cents for derris and 10 cents for cube (United States currency). For ground root of the same quality and ready for use as an agricultural dust the prices were 39 cents for derris and 28 cents for cube. Between 130 and 140 lbs. of ground cube could therefore be purchased for the price of 100 lbs. of ground derris of the same rotenone content. This represents a considerable saving to the farmer, especially during the present recession.

Further, the general opinion was held that with increasing supplies of both derris and cube coming forward prices would tend to fall, also the price advantage in favour of cube would tend to diminish.

This all-important price difference is the only factor opposing the use of derris in the United States. More than one insecticide manufacturer assured the writer that if only Malayan derris were available at a price with which it could compete with cube they would prefer to use derris. They considered that Malayan exporters, by seeking too high a price for their product in recent years, had tended to stimulate the production of cube.

The opinion expressed regarding a fall in price of the whole root and a diminution in the price advantage in favour of cube has been confirmed. Reference to the *Malayan Agricultural Journal* for December 1938 shows that the latest price for derris root of 5 per cent. rotenone content, c.i.f. New York, is about 11 cents per lb., that for cube root of the same rotenone content being about 8.5 cents per lb.

With regard to cube, it would appear that this is now liable to royalties under the Dennis patent amounting to rather less than 1 cent per lb. bringing the total cost of this root up to approximately 9.5 cents per lb. c.i.f. New York.

The Dennis patent refers to a patent granted in the United States in 1927 to Mr. W. J. Dennis who obtained exclusive privileges to the use of ground cube root with the fibrous element removed as an insecticide and vermifuge.

The admissibility of the patent on certain technical grounds was challenged by some of the insecticide manufacturers but apparently the original patent has been upheld by the Courts.

Further, with the fall in the price of both commodities the price advantage in favour of ground cube root has diminished, there being only a 4 cent spread between the price at which derris and cube powders are offered compared with one of 11 cents as mentioned above.

No mention has been made of the price of root sold on the basis of ether extract, for example, *D. malaccensis* from the Kinta District. At present there is only a small demand for such root, which is used for mixing with root rich in rotenone to give a blend as required for a certain purpose. The solvent extract from this root, mixed with pyrethrum extract, is also used to some extent in the preparation of sprays against household insects, for example, flies and gnats.

In April 1938 the current price for derris root of 18 per cent. ether extract was about 10 cents per lb., c.i.f. New York, compared with 14 cents per lb. for root sold on a 5 per cent. rotenone basis. Since that date the price of this root has declined to about 7 to 8 cents per lb., this figure being somewhat nominal.

Derris Elliptica, Changi No. 3, Root.

All parties were particularly interested in the results of our selection work with the above type and were surprised to learn of the high rotenone content of the roots of some of our clonal material. As stated previously, the toxic content figures are of the order of 12 per cent. rotenone and 25 to 30 per cent. ether extract, calculated on a moisture-free basis.

At present, it is extremely doubtful whether a market exists for such a high quality root at a price commensurate with its toxic content based on either rotenone or ether extract.

The bulk of the derris and cube root as imported is used in the form of dust, being diluted with the requisite amount of inert material, for example talc or clay, to a definite rotenone content say 0.75 per cent. For such purposes a high rotenone content is rather a disadvantage. In the first place much more of the diluent is required. Thus, assume that a finished dust containing 0.75 per cent. rotenone is required. With a ground root of 5 per cent. rotenone content approximately 600 lbs. of the diluent would be necessary for each 100 lbs. of powder but with ground root containing 12 per cent. rotenone no less than 1500 lbs. of diluent would be required.

Secondly, the more diluent that is added the more thorough must be the mixing to ensure an even distribution of the powder throughout the mass. This applies more particularly to the farmer or market gardener who may carry out the mixing of the powdered root and diluent himself on a cement floor using only a shovel or other similar implement.

Thirdly, even with satisfactory mixing, there is a smaller chance of a direct hit on an insect owing to the smaller number of toxic particles in the mass.

Fourthly, in the case of the high quality root, mixing would have to be carried out close to the place where the insecticide was required. It would be uneconomic

to pay heavy freight charges payable on insecticide containing such a large proportion of inert material which itself would be transportable in bulk at much lower rates.

Although the disadvantage of diluting with such a large amount of inert material might be avoided by a preliminary blending with root of low quality, for example, *D. malaccensis* from the Kinta District, to the present standard, this presumes a large supply of low quality root to be used merely as a diluent and for which manufacturers would only be prepared to pay accordingly.

The cultivation of two distinct qualities of root would be most unsatisfactory from the point of view of general agricultural practice; it is extremely unlikely that support for the low quality root would be forthcoming, in fact it would be contrary to the best interests of the industry.

Under such conditions it would appear preferable to consider the development of another type, *D. elliptica*, Sarawak creeping, which is characterised by a remarkably high yield of root combined with a moderate toxic content, rotenone 6 per cent. and ether extract 18 to 20 per cent. It is understood that such root would be most acceptable to insecticide manufacturers for use in the preparation of a dust.

As far as could be ascertained, the real future of high grade root, such as *D. elliptica*, Changi No. 3 lies either in the preparation of impregnated dusts or oil emulsions. In the case of impregnated dusts, the powered root would be solvent extracted and the extract mixed with the inert material, possibly exhausted or partially exhausted ground root from a previous extraction. Evaporation of the solvent would leave an impregnated dust. An oil emulsion would be prepared by making a solvent extract and after evaporation of the solvent suspending the residual resins in a mineral oil by means of a stabiliser.

There is one serious drawback to the use of a vegetable insecticide, such as derris or cube, namely the comparatively rapid deterioration in toxicity of the material when exposed to light and air. The research staffs of various organizations are working on the problem of the addition of anti-oxidants or preservatives to insecticidal preparations having derris and cube as a basis, with the object of inhibiting this deterioration. It will be realized that if a successful preservative is discovered a much wider field for these insecticides will be opened. It may then, for example, be possible to use them against the codling moth on apples to the exclusion of arsenical preparations.

Enquiries were made regarding the possibility of extracting only the rotenone from *D. elliptica*, Changi No. 3 root and marketing it as such. There is, however practically no demand for pure rotenone as an insecticide. As far as could be ascertained its sole application had been in moth-proofing materials such as fur-coats and carpets, the rotenone being dissolved in a solvent, for example, ethylene dichloride, and the material sprayed with the solution.

In view of the overloaded and falling state of the market, manufacturers were unwilling to commit themselves as regards the price which such high quality root as *D. elliptica*, Changi No. 3 might be expected to command compared with root

of 5 per cent. rotenone content. A tentative suggestion was one cent for each additional per cent. of rotenone over 5 per cent. Assuming the present price of derris of 5 per cent. rotenone content to be 11 cents per lb., *D. elliptica*, Changi No. 3 root with 12 per cent. rotenone would be worth about 18 cents per lb. Other manufacturers said that, assuming the present method of applying derris dust to continue, the price would be too high compared with the standard product. If, however, a demand arose for high quality root either for impregnated dusts or oil emulsions, there might well be such a price spread between the two qualities, since solvent extraction would only be an economic process for the high quality root.

Discussion on Results of Investigation.

The present prospects for Malayan derris in the United States cannot be considered bright.

While the product is popular as an insecticide, severe competition with cube has reduced the price to such an extent that little or no profit is left for the cultivator. The present price of 11 cents per lb. c.i.f. New York, after allowing say 4 cents per lb. for freight from Malaya to United States, corresponds to approximately \$17 per picul (Straits currency) for root delivered in Singapore.

The future trend of the market is also difficult to foresee. It depends upon whether supplies of cube are maintained at the present low price, also whether fresh applications for both derris and cube are discovered, particularly for material rich in rotenone. If the bulk of both products continues to be used as dust it is possible that a medium quality root, such as *D. elliptica*, Sarawak creeping, with its high yield of root may be the most suitable for general cultivation. Much depends, however, on whether a strain of *D. elliptica*, Changi No. 3, can be evolved in which high yield of root can be correlated with high toxic content.

In view of the present low price of derris and the high proportion which the shipping charges bear to the price of the root, enquiries were made as to whether Malaya would be better advised to consider the possibility of grinding the root locally and exporting the powder, thereby following the example of Brazil with cube root. Although such a procedure would result in a reduction of shipping charges, there are certain disadvantages, for example, the cost of machinery, the health hazard and the *ad valorem* tax on entry into the United States.

Laboratory experience has shown that it is much more difficult to reduce derris root to a powder than cube root, the latter being of a soft spongy nature compared with the hard fibrous derris root("). This view is confirmed by New York importers, who state that the machinery required for the efficient grinding of derris root is both intricate and expensive. For example, the latest type percussion mills, which are used for this purpose, are water-cooled to prevent the material from becoming too hot, thereby avoiding the possibility of any decomposition in the resins. It has been found that if the material heats too much during the grinding there is a decrease in the rotenone content. This confirms results obtained in this

laboratory some years ago when it was found that if powdered root were dried in a vacuum oven at 80°C. before analysis, a lower rotenone content was found than if air-dry powder were used.

One of the latest type percussion mills may cost as much as \$25,000 (United States currency). In view, therefore, of the high cost of machinery, it is more than probable that a central organization would have to be formed to carry out the grinding of the root and the blending of the product. It would undoubtedly be more economical in the long run to have one large mill working continuously and maintaining a standard product rather than a number of small mills running intermittently.

The health hazard is considered somewhat serious in the United States. Particular care is taken to maintain all parts of the mill in an air-tight condition to avoid throat affections of the workers owing to the fine dust floating in the atmosphere.

The 10 per cent. *ad valorem* tax has been mentioned previously.

Although the export of ground derris root would affect some of the American importers who have installed special mills for this purpose, there seems little doubt that it is inopportune principally on account of expense and uncertainty regarding the future trend of the market, to suggest such a radical change in the mode of packing and shipment. It would appear preferable for the present to endeavour to raise the quality of the root by planting only selected material, thereby eliminating to a large extent the present variability.

Shipping charges may also be reduced by chopping the root into short lengths before baling. This enables a much greater weight of root to be compressed into a bale of given dimensions; for example in a bale of 42" x 30" x 28", 240 lbs. of chopped root can be packed compared with 175 lbs. of whole root. Attention has been drawn in a previous number of this journal to the question of baling chopped root.⁽³⁾

Research Work on Vegetable Insecticides in the United Kingdom.

On his return to England the writer was invited to attend a meeting of the Imperial Institute Consultative Committee on Insecticidal Materials of Vegetable Origin to give an account of his visit. This Committee is part of the organization recently established in the United Kingdom for dealing with the question of these insecticides.

A brief summary of the developments to-date is as follows:—

At a meeting held in July 1937 at the Colonial Office, the Colonial Advisory Council of Agriculture and Animal Health decided that in view of the growing importance of vegetable insecticides, co-ordination was essential between the organizations engaged in research work in connexion with such products.

The organizations are:

- (a) Imperial Institute.
- (b) Rothamsted Experimental Station.
- (c) Department of Agriculture, Straits Settlements and Federated Malay States.

(d) East African Agricultural Research Station, Amani, Tanganyika Territory.

(e) Department of Agriculture, British Guiana.

The Council also considered that the work already in progress at the Rothamsted Experimental Station should be extended by the recruiting of additional staff, grants to meet the necessary expenditure being obtained from the United Kingdom Development Fund and the Colonial Development Fund.

An organic chemist and an entomologist have been recruited and a three-year programme of work laid down. It was decided to concentrate work on the rotenone (and allied substances) content of vegetable insecticides, notably derris. The main lines on which investigations are proceeding are as follows:—

- (a) The various analytical methods for determining rotenone with a view to arriving at some method which could be accepted as a standard and which would give uniform results in the hands of all workers.
- (b) The other toxic materials which occur in derris with the object of throwing some light on the toxic substances which occur as precursors of toxicarol, deguelin and other compounds which have been isolated from derris.
- (c) The devising and standardization of satisfactory biological methods for testing the toxicity of insecticides such as derris.

Arrangements have also been made whereby the results obtained are made available to workers of the other organizations engaged on research on the same lines.

The writer attended a meeting at the Imperial Institute to discuss the question of the adoption of a standard method for the determination of rotenone, while he also visited the Rothamsted Experimental Station in connexion with work on this subject.

In addition, as indicated above, the Imperial Institute has set up a Consultative Committee on vegetable insecticides, one of the functions of which is to maintain touch with the commercial interests involved with a view to providing reliable information concerning the future supply and demand for such materials.

A monograph on the subject of insecticidal material of vegetable origin is in course of preparation by the Committee, who also issue a quarterly bibliography of all literature on this subject

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Received for publication 31st December, 1938.

QUARTERLY REPORT ON THE MALAYAN PINEAPPLE INDUSTRY, SEPTEMBER-NOVEMBER, 1938.

Prepared by the Economics Branch from Reports of Field Officers.

Factories.

The centres of the Malayan pineapple canning industry are Johore, Singapore and Selangor. There are 5 registered factories in Singapore, 6 in Johore and 3 in Selangor. Of the 5 factories in Singapore, 3 are in regular production, 1 has been closed down since July, while at the fifth factory work has been confined to the experimental packing of pineapple juice. Fruit supplies in Johore during October were only sufficient to permit of 3 factories working, but in November increased supplies resulted in a further 2 factories working. In Selangor, only one factory operated throughout the quarter.

Areas.

The area planted with pineapples has declined during 1938. It is estimated that there are now only 2,700 acres planted in Singapore. This decline is attributed to poor soil conditions, and to the very low prices which have prevailed until recently. It is unlikely that this acreage will be extended, owing to the growing demand for food crops, and Singapore factories will soon depend entirely on Johore for their supplies of fruit.

Returns of areas under pines in Johore show that 43,177 acres are planted as a sole crop and 6,085 acres as a catch crop, giving a total of 49,262 acres. Deterioration of pineapple land is apparent in the older planted areas and it is questionable whether these areas can continue to produce marketable fruit much longer.

Consideration is being given by some growers to the possibility of converting their lands to rubber under the new rubber planting conditions. If this conversion takes place it is probable that at least 10,000 acres will be affected.

There has been a reduction of planted area in Selangor this year of about 2,000 acres, old areas being cut out in favour of other crops owing to the low price of pines for canning. The present area is 6,909 acres, of which 2,245 acres are planted with pines as a sole crop.

The present total area of pineapples for canning is therefore about 59,000 acres, as compared with about 70,000 acres a year ago. It is not anticipated, however, that there will be any serious diminution of supplies, the present area being sufficient to maintain the industry at about its present level.

Production.

In November, Singapore production was approximately 17,000 cases a week. Exports of canned pineapples from Johore for the first 10 months of 1938 amounted

to 64,608 tons, and the estimated export for 1938 from this State is 74,000 tons, a decrease of 6,000 tons over 1937. During the quarter September-November 1938, 28,347 cases of pines were sold from Selangor factories.

In the first nine months of 1938, the total exports of pineapples from Malaya amounted to 59,987 tons (or 1,937,012 cases) valued at \$5,915,235 (about £606,000), as compared with 68,773 tons (2,222,451 cases), valued at \$7,560,083 (£889,400) during the corresponding period of 1937.

Prices.

A Central Board of Pineapple Packers is in process of formation. The main objects of the Board are to control production to meet the demands of the market, and to fix the price of the canned product at a level which will ensure a fair profit to growers and packers. The arrangements for the functioning of the Board appear to be working smoothly.

Prices during the quarter under review have necessarily been somewhat uncertain and The Singapore Chamber of Commerce has ceased to quote prices in their weekly circular, contenting themselves by noting that prices are nominal. The present intention of the Board is to fix the basic price of $1\frac{1}{2}$ lb. standard cubes at \$3.00 per case of 48 cans and the quota for the present short cropping season at 850,000 cases, the season period extending from October 17th, 1938 to March 31st., 1939. Stocks of canned pineapples in Malaya are necessarily high during this reorganization of the market, but as reports place London and Liverpool stocks at the lowest figure for several years, it may be anticipated that deliveries from Malaya will increase in the near future.

An Association of Growers is in process of formation and agreement has been reached on a code of rules for this Association. It is anticipated that this Association will be able to safeguard the interests for the producers of fruit.

Abstract.

THE EXPORT CROPS OF THE NETHERLANDS INDIES IN 1937.

*Bulletin No. 157 of the Central Bureau of Statistics of the
Netherlands Indies.*

The trade recovery started in 1936 was well maintained in 1937; the volume of the agricultural exports exceeded that of 1936 by 21 per cent. and in value by 82 per cent.

Of the total value of the 1937 exports of agricultural produce, amounting to Gs. 660 millions, Gs. 358 millions or 54 $\frac{1}{4}$ per cent. was estate produce and Gs. 302 millions or 45 $\frac{3}{4}$ per cent. was native produce. The proportionate increase of the native produce, already discernible in the last few years, has been greatly accentuated.

Expressed in percentages of total world exports of important agricultural exports the 1937 exports from the Netherlands Indies were: cinchona 90 per cent., pepper 79 per cent., kapok 70 per cent., rubber 38 per cent., copra 30 per cent., agave-fibre (sisal) 23 per cent., oil palm products 20 per cent., and tea 17 per cent.

Cane Sugar.

The area planted with pedigree cane to serve as planting material was 4,804 hectares* and the crop from 365 hectares of this area had to be milled. This is slightly below the average of about 5,200 hectares for the last five years. Production from the total planted area of 83,659 hectares was 1,379,924 tons†—more than twice the average of about 607,000 tons of 1934-36. Total exports were 1,128,134 tons. Cane sugar production for the year 1937-38 is estimated to be 7.4 per cent. of the world's total cane sugar production.

Native-owned area producing sugar for home consumption increased from 12,909 hectares in 1936 to 14,447 hectares in 1937.

Rubber.

The estate planted area was 593,736 hectares, 534,571 hectares of which were in bearing. A total area of 13,914 hectares of old rubber was cut out and 13,184 hectares were planted with superior material. Of the total area planted 165,879 hectares (28 per cent.) are budded rubber, 84.3 per cent. of which was planted before 1934.

The native-owned planted area in Java contains nearly 8 million trees, 61 per cent. of which are tappable. For the native-owned planted area in the Outer Provinces the figure given a year ago have remained unaltered.

* 1 hectare = 2.472 acres.

† Throughout this Abstract, "ton" refers to the metric ton of 2,200 lbs.

Total exports in 1937 were: estates 245,044, native 208,551, total 453,595 tons.

The quality of the native product exported continues to improve and the percentages for first, second and third quality in 1937 were respectively: 87.4, 0.4 and 12.2 per cent. This improvement is due partly to the fact that for export of wet rubber, coupons for the full wet weight have to be surrendered. This policy has greatly stimulated the activity of the local remilling factories. From 1933 to 1937 their number rose from 23 to 52 and their output from 10,105 tons to 58,455 tons.

Coffee.

The planted estate area was 107,171 hectares, 84½ per cent. of which is in Java; the area of native-owned plantations in Java was 23,423 hectares; the area of the latter in the Outer Provinces is not known, but must be considerable. Estate production was 62,404 tons and the export of native-grown coffee from the Outer Provinces was 69,627 tons, 92 1/3 per cent. of which came from Sumatra. The bulk of the production (93.2 per cent.) is Robusta coffee.

Tea.

The planted estate area was 139,034 hectares, 75½ per cent. of which is in Java and 98 per cent. of which is in bearing. No native tea is grown outside Java. In Java the native-owned area was 67,501 hectares, of which 4,227 hectares have been abandoned. Of the remaining 63,274 cultivated hectares, 98¾ per cent. are in bearing. The total quantity of estate produce, including 12,170 tons dry weight of purchased native-grown leaf, representing a value of Gs. 4,831,151 was 74,516 tons.

Tobacco.

The particular features of this cultivation and of the preparation for export were fully described in Vol. XXII (1934) of this Journal.

The estate crop of the high grade leaf for cigar wrappers, which is confined to the East Coast of Sumatra, was 14,153 tons. In Java and Madura estate cultivation of cheaper grades and the European-managed curing establishments of purchased native-grown leaf produced a crop of 14,651 tons of "leaf tobacco" and 18,670 tons of "crude tobacco."

Further, there is a large native production for home consumption and its export surpluses in 1937 were 16,496 tons for Java and 1,380 tons for the Outer Provinces.

Cinchona.

The 1937 production of dried cinchona bark was 10,425 tons. Export of native-grown bark was 93 tons and the Bandoeng quinine factory further purchased nearly 10 tons of native bark with an average percentage of 3.53 and a quinine equivalent of 343 kilogrammes.

New restriction regulations came into force on 1 January 1937.

Oil Palm Products.

Of a total planted area of 83,278 hectares, 70,213 hectares are in bearing. Production amounted to 199,092 tons of oil (inclusive of kernel oil) and 41,826 tons kernel. Exports were respectively 196,895 and 41,471 tons. Of the total planted area 91.7 per cent. is in Northern Sumatra where the yield of oil per hectare in bearing is now 2,896 kilogrammes.

The Netherlands Indies in 1937 contributed fully 40 per cent. to the world's exports of palm oil and 5.9 per cent. of kernels.

Copra.

The estate area in bearing is: Java 5,880 hectares and Outer Provinces 32,531 hectares, together producing 32,065 tons copra equivalent. In addition, 1,342 tons copra equivalent of native produce was purchased and worked.

Domestic consumption in Java and Madura in 1937 for the first time in four years did not require an import surplus; the export surplus has been 36,182 tons copra equivalent, the bulk of which was native-grown produce.

The local oil mills in Java and Madura in 1937 milled 193,633 tons of copra for home consumption of coconut oil and those in the Outer Provinces 20,592 tons of copra. These figures do not include domestic consumption of nuts for culinary purposes and for oil extraction in the small native village oil mills.

The export surplus from the Netherlands Indies in 1937 was 498,241 tons of copra, nearly all of which came from the Outer Provinces. The copra equivalent of oil and nuts amounted to 46,797 tons, making a total of 545,038 tons of copra equivalent exports.

Essential Oils.

The 1937 export of citronella oil was 1,419½ tons. Exports of other essential oils were: cajuput-oil 72½ tons, vetiver oil 20 tons, patchouli oil 22 tons; in addition to this 1,155 tons of dried patchouli leaf was exported to Singapore and Penang distilleries.

Hard-rope Fibres.

Chiefly sisal, grown on estates. The 1937 export—not including refuse—was 85,231 tons.

Kapok.

This crop is almost entirely native grown and the bulk of the exports are from Java. The total 1937 exports were: fibre 19,018, seeds 19,465, oil 3,239 and oilcake 17,887 tons.

Only *Ceiba pentrandra* L. is cultivated.

Pepper.

The 1937 exports were:—

		Black	White (in tons)	Total
Sumatra	... ..	19,914	776	20,690
Banka and Billiton	... ..	567	8,960	9,527
Borneo	... ..	73	2,309	2,382
		<hr/> 20,554 <hr/>	<hr/> 12,045 <hr/>	<hr/> 32,599 <hr/>

as against a total of 77,582 tons in 1936.

Tapioca.

The planted native area of 950,000 hectares as well as the production of 7,637,000 tons of fresh tubers and the export surplus of 1,280,000 tons of fresh tubers are record figures.

This crop is almost exclusively grown by natives in Java for home consumption; the planted estate area and production are relatively insignificant.

The 1937 exports were: dried tubers 20,935 tons, dried and ground 172,644 tons, flour 203,021 tons, flake and siftings 7,263 tons, pearl and seed 13,166 tons, fibre residue 24,239 tons.

Derris.

The export of dry roots fell from 318 tons in 1935 to 131 tons in 1937. In 1937 the total planted area was 2,305 hectares of which 610 were in bearing.

Gambier.

This crop is mostly native-grown in the Outer Provinces which in 1937 exported 6,118 tons to foreign countries and 4,051 tons to Java. Estate production was 3,335 tons.

Nutmegs.

No reliable figures for planted area, production and home consumption are available. The 1937 exports were: shelled nuts 2,052 tons, unshelled nuts 2,363 tons, mace 709 tons. The Banda Islands group is the chief supplier.

Arecanuts.

This is entirely a native crop. In 1937 exports from Java were 7,002 tons and from the Outer Provinces 49,388 tons.

Cloves.

The 1937 exports from the Outer Provinces to Java were 520 tons and to foreign countries 521 tons. Java imported further 4,410 tons, chiefly from Zanzibar.

Rice.

Java, with a crop of 3,944,430 tons of husked rice from a harvested area of 3,867,000 hectares in 1937, for the second time had an export surplus, this time amounting to 197,563 tons. Most of it went to the Outer Provinces.

The Outer Provinces in 1937 had a net import surplus of 344,517 tons, so that the net import surplus of the whole of the Netherlands Indies was 146,954 tons for a population of about 65 millions. Bali, Lombok and Celebes always have a surplus available for export to other parts of the Outer Provinces.

Maize.

Of Java's crop of 2,036,900 tons of husked grain from a planted area of 2,069,000 hectares, 140,012 tons were exported to foreign countries. The Outer Provinces in 1937 exported 72,475 tons to foreign countries. Practically all of this came from Celebes.

Groundnuts.

Exports to foreign countries in 1937 amounted to 55,229 tons of decorticated nuts from Java and 7,252 tons from the Outer Provinces.

Soya Beans.

In Java, cultivation and production are still increasing and from a crop of 268,900 tons of dry beans 15,250 tons were available for export, mainly to the Outer Provinces. There, too, production is increasing and imports decreasing.

Sago.

The 1937 exports to foreign countries were 37,716 tons mainly from the East Coast of Sumatra and the Rhio Islands.

Miscellaneous Crops.

The 1937 exports of a number of minor crops were, in tons:—

Benzonin Gum	...	1,852	Gutta Percha	...	2,688
Cassia	...	2,368	Illipe, Nuts	...	787
Chillies	...	2,515	„ Fat	...	11
Cocoa	...	1,340	Kratok Seed	...	2,336
Cotton, cleaned	...	969	Onions	...	2,977
„ uncleaned	...	3,032	Ricinus	...	6,688
„ seed	...	1,481	Sesamum	...	3,377
Cubebs	...	201	Tamarind	...	2,149
Fruit, fresh	...	9,247	Vegetables, fresh	...	11,339
„ dried	...	2,157	„ dried	...	533
„ canned	...	317	Potatoes	...	1,067

L.A.J.R.

Reviews.

British Breeds of Live Stock.

Bulletin No. 86 Ministry of Agriculture and Fisheries. Sixth edition. October, 1938. 152 p.p. illustrated. H.M. Stationery Office, London. 4s. 6d.

This book describes and illustrates all the recognised British breeds of live stock and will therefore have a very wide appeal in view of the extensive distribution of the progeny of British stock.

The existence of the numerous and specialized breeds in Britain is accounted for by the very wide range of climate, altitude and soil. The Foreword reminds us that "Great Britain has for many centuries been the home of excellent breeds of all kinds of stock. Some of these breeds have proved themselves so eminently suited to the conditions of their native districts that they have long remained comparatively unchanged. Other breeds, however, have been subjected to selective improvement at the hands of notable breeders in an attempt to increase both the quality and the quantity of the meat, milk or wool they produce, or as regards horses, to improve their speed, stamina, size and strength, and thus meet modern requirements."

The wide range of British stock is shown by the fact that this book describes 20 breeds of horses, 28 of cattle, 33 of sheep, 12 of pigs and 6 of goats. The descriptions of the various breeds have been supplied by the Breed Societies, but the reader is also given much additional information, concisely stated, on such points as origin of breed, distribution, and particular points in favour of each breed.

The inclusion of a list of Breed Societies together with the principal places for public sales, exhibitions and shows, which is given at the end of the book, was a happy inspiration, for it will enable breeders throughout the world to get into direct touch with reputable sellers of any breed.

A word of praise must be added for the excellence of the illustrations—over 100 in number. Doubtless, the inclusion of this large number of illustrations is responsible for the relatively high price of the book, but the value of the volume is greatly enhanced by their inclusion. The price, however, is only expensive in comparison with other publications of the Ministry of Agriculture. The reviewer confidently recommends this book to the stock breeder and keeper; it will prove to be the cheapest and most valued book on his shelf.

D.H.G.

Journal of the Rubber Research Institute of Malaya.

Vol. 8 No. 3. November 1938. Published by the Rubber Research Institute, Kuala Lumpur. Price 50 cents (Straits currency).

The following are the more important articles included in the current number of the Journal of the Rubber Research Institute of Malaya.

The Effect of *Lalang* on Growth of Young Rubber Trees.

Oidium Heveae by F. Beeley.

Experiments with Economic Tapping Systems (1): Part VII by C. C. T. Sharp.

Prevention of Mould Growth on Sheet Rubber during Storage by J. D. Hastings and J. H. Piddlesden.

Experiments with a New Type of Smoke-house by J. H. Piddlesden.

Plasticity and the Colour of Sheet Rubber by J. D. Hastings.

The Constituents of Hevea Latex Parts V and VI by K. C. Roberts.

Latex Preservatives: 1. Some Preliminary Experiments with Sodium Pentachlorophenate—"Santobrite" by Edgar Rhodes.

Notes on a Visit to Indo-China by J. H. Piddlesden.

Creaming Latex with Synthetic Creaming Agents; and Creaming Latex with Tamarind Seed Powder by Edgar Rhodes and K. C. Sekar.

Rubber Statistics 1900-1937.

Barker, P.W. and Holt, E.G. Trade Promotion Series No. 181 U.S.A. Government Printing Office, Washington 1938. 54 pp. Price 10 cents gold.

This publication of the statistics of production, absorption, stocks and prices of rubber over a period of 37 years will be found useful for easy reference. It is not possible to obtain from any other reference book all the basic statistical data necessary to a study of the development of the rubber manufacturing industry from 1900 to 1937; as a matter of fact, information on such an important subject as the price of the prime raw material of the industry is not readily available from any one source.

This small book is recommended to manufacturers, importers, dealers, and other interested in the rubber trade.

Departmental.
FROM THE DISTRICTS.

December, 1938.

The Weather.

The weather was unseasonably dry over the whole country for the greater part of December. In the West Coast regions rain occurred during the last week of the month.

Kelantan continued to experience good falls of rain, though in inland districts the average for the month was below normal.

In Pahang weather conditions were similar to those experienced on the west coast but in coastal districts, very heavy falls of rain in the last days of the month caused floods.

In Jelevu, Negri Sembilan, heavy rain occurred throughout the month.

In Johore the total precipitation was below average except in Johore Bahru. In Singapore and Johore Bahru conditions were normal.

Crop Reports.

Rubber.—The level of market prices for this commodity remained almost the same as in the previous month. There was not much tapping carried out on small holdings. In Selangor, however, it is reported that activity has recommenced, and tapping was general with the intention of accumulating a stock of rubber for sale with the new issue of coupons in the first quarter of 1939.

In Kedah the sale of coupons by owners of small estates and small holdings is giving rise to much unemployment.

Small-holders are taking an increasing interest in the planting of new land and planting rights have risen in value. In Selangor share certificates are now reported to be difficult to obtain and rights to plant one acre are now worth \$31. It is reported that a large number of share certificates have gone over to Pahang, where Chinese have taken up new areas.

In Selangor also considerable interest is being taken in replanting. Six multiplication nurseries have already been established in Ulu Langat, and an order for 4,300 clonal seeds has been effected for small holders in this District.

The co-operative rubber marketing groups at Sijangkang, Ijok and Bandar in Selangor continue to function satisfactorily. The last two groups are now undertaking co-operatively the bulk coagulation of latex and manufacture of sheet. A further group is in process of organization at Jendram.

In Kelantan a survey of areas which formerly produced almost solely lump rubber indicates that production of this form of rubber has nearly ceased. At the present time uncoupons lump rubber is worth only \$1.50 per picul. Good quality smoked sheet (Chinese Prime) commands a premium of \$3.50 to \$3.75 per picul.

Unsmoked sheet continued to be the most general form in which sheet rubber was disposed of in Johore, and in several districts all small smoke houses were idle.

Padi.—The dry weather does not appear to have affected adversely the padi crop; in fact, where the crop has reached the harvesting stage the absence of rain was a great advantage. In the Jelebu District, where considerable rain fell throughout the month, the harvest was held up.

Reports from Kedah state that the crop as a whole is very satisfactory, though a few areas which were affected by floods earlier in the season will not do so well. In North Kedah a large part of the crop has already been reaped.

Harvesting is also in full swing in Pahang. During the present season the weather conditions in this State have, as far as padi is concerned, been most unfortunate. When the heavy rains occurred on the east coast at the end of December most of the crop, however, had been harvested.

Pineapples.—Fruit supplies continue to be plentiful but by the end of the current month the season should be on the wane. The lull in buying, which occurred when the Central Board first commenced operations, has now terminated. Stocks in England are said to have been almost exhausted. During December buyers in the United Kingdom placed large orders for canned pineapples and exports were heavy.

Poultry.—Outbreaks of poultry disease have occurred in several parts of the country. In Malacca bad epidemics have been reported. In Krubang mukim the attack has been particularly severe, poultry over large areas being completely wiped out. The villagers restock with chicks from Chinese hatcheries

DEPARTMENTAL NOTES.

Demonstration Canning Factory.

The machinery for the new Demonstration Canning Factory and Research Station, Johore Bahru, has now arrived or is expected shortly and the work of installation is progressing rapidly. It is hoped that most of the machinery will be installed by the end of January. The Factory and Station is in charge of Mr. W. J. B. Johnson, Canning Officer, of this Department.

Visitors to the Ayer Itam Agricultural Station, Penang.

The Agricultural Officer, Province Wellesley and Penang, reports that 229 persons visited the Station during December. A large number of visitors is gratifying, but may prove a source of embarrassment. The visitors to the Station are most numerous on Sundays when they arrive in such numbers that they are difficult to control; while, for example, one party is being conducted round the pig sties, another is possibly tasting the rambutans, and a third, in an endeavour to see how bud-grafting works, is quite likely to remove the scions from the stocks!

Profit from Fruit Orchards.

The State Agricultural Officer, Pahang, in his report for December points to the profits that are possible in that State from a well-run orchard within reasonable proximity to a large town. He instances one such orchard of 5 acres, where rambutans of good quality are the fruit chiefly grown. Soil erosion is guarded against, the trees are pruned and regularly manured with groundnut cake, and an average annual production of 150,000 fruits from the orchard is obtained. The sale price ranges from 30 to 70 cents per 100 fruits. The gross annual income from the orchard is from \$300 to \$500, while as much as \$800 was obtained one year.

The raising of improved planting material of fruits is a feature at all suitable Agricultural Stations throughout the country, and the demand for planting material has been strong for some time, proving that orchard owners are alive to the importance of obtaining good stock and confident of the quality of material supplied from the Stations.

Appointment.

Mr. B. Bunting, Senior Agriculturist, has been appointed to act as Chief Research Officer, with effect from 21st December 1938 inclusive.

Leave.

H. H. Tunku Yacob bin Sultan Abdul Hamid returned from leave and resumed duty as Principal Agricultural Officer, Kedah, with effect from 1st December 1938.

FERTILIZER PRICES, DECEMBER, 1938.

The following are the prices at the end of December, 1938, of some of the more important fertilizers.

more important than

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	80.00
Muriate of Potash	...	—	—	50	112.00
Sulphate of Potash	...	—	—	48	112.00
Superphosphate (concentrated)	...	—	39 - 40	—	105.00
Superphosphate	...	—	16 - 18	—	60.00
Basic Slag	...	—	16	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	40.00
Lime	...	—	—	—	20.00

* Citric soluble.

‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical.

MARKET PRICES.

December, 1938.

Major Crops.

Rubber.—The Singapore price for No. 1 X. Rubber Smoked Sheet varied between 27½ and 28½ cents per lb. Average prices per lb. for the month were:—Singapore 27.75 cents, London 8.01d., New York 16.01 cents gold, as compared with 27.96, 8.15d. and 16.01 cents gold respectively in November.

Prices paid for small-holders' rubber at two centres during December are shown in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, December, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.			
	8	15	29	7	14	21	28
Smoked Sheet ...	34.40	34.20	—	—	—	34.53	—
Unsmoked Sheet ...	33.00	33.00	33.50	32.86	31.50	32.97	30.61
Scrap ...	No purchases						

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases of rubber at Kuala Kangsar during the month, or at Kuala Pilah on 22nd December.

Palm Oil.—Prices in December showed little variation over those ruling during the previous month. The average of weekly quotations per ton in November were:— palm oil £13-4-2, kernels £8-3-4. Prices in December are shown in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
December 9	£ 13. 5. 0 Montreal	£ 8. 7. 6 Amsterdam
" 16	13. 0 0 Liverpool	8. 10. 0 Holland
" 23	13. 0. 0 "	8. 10. 0 Rotterdam
" 30	13. 0. 0 "	8. 10. 0 "
Average	£ 13. 1. 3	£ 8. 9. 4

Copra.—The upward tendency of prices towards the end of November was maintained during December. The average Singapore price per picul for sun-dried in December was \$3.28, while the mixed grade averaged \$2.97 per picul. Corresponding average prices in November were \$3.06 and \$2.73 per picul.

Copra cake prices dropped early in the month from \$2.05 per picul to \$1.60. The average price per picul in December was \$1.69.

Rice.—The average Singapore wholesale prices of rice per picul in November were as follows:— Siam No 2 Ordinary \$4.40, Rangoon No. 1 \$3.50, Saigon No. 1 \$3.90, as compared with \$4.47, \$3.70 and \$4.07 respectively in October, and \$4.12, \$3.92, and \$3.82 respectively in November 1937.

The average retail prices in cents per gantang of No. 2 Siam rice were:— Singapore 28, Penang 32 and Malacca 30.

The average declared trade value of imports during November was \$3.85 per picul, as compared with \$4.00 per picul in October 1938, and \$4.09 per picul in November 1937.

Padi.—Prices have eased in Kedah and Malacca. The Kedah price was \$12 to \$12.60 per 160 gantangs, the mills paying \$2.10 per picul, but bought at around \$1.90 per picul when the new crop was harvested. Prices in Perak were around those of the previous month. In Malacca padi was \$7 to \$8 per 100 gantangs as compared with \$10 to \$11 in the previous month. Johore prices varied between \$11 and \$14 per 100 gantangs.

The Government Rice Mill, Krian, Perak, paid \$2.30 per picul, and the Government Rice Mill at Temerloh, Pahang, from \$2 to \$2.25 per picul.

Pineapples.—The Singapore prices per case of canned pineapples were as follows:— G.A.Q., Spiral \$2.90, Round \$3.80, Cube \$3.00; Golden \$3.20, \$4.00, \$3.25 respectively. Sales for December were 500,000 cases, the bulk of which was sold between 15th and 24th. Latest reports state that good business continues for both nearby and forward.

The Singapore price of fresh fruit for canning was \$1.00 to \$1.80 per 100. In Johore south, the prices were per 100: 1st quality \$1.50 to \$1.20, 2nd \$1.10 to 90 cents, 3rd 95 cents to 60 cents. The Selangor price was from 50 to 80 cents per 100 fruits.

Beverages.

Tea.—Six consignments of lowland tea, comprising 327 packages were sold on the London market during December, at prices ranging between 10½d. and 1s.0½d. per lb., the average price being 11.38d. per lb. During the month three consignments of upland tea, comprising 348 packages were also sold in London at prices ranging between 1s. 1¼d. to 1s. 2½d. per lb., the average price being 1s.2.08d. per lb.

According to *The Tea Brokers' Association of London Reports* for December, the average London prices per lb. realized during the month for tea from other countries were as follows:— Ceylon 1s. 3.14d., Java 11.83d., Indian Northern 1s. 0.99d., Indian Southern 1s. 1.63d., Sumatra 10.40d. Java 11.83d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 30th December, 1938, of the Ceylon Brokers' Association, are as follows, in rupee cents per lb.:— High Grown Teas 78, Medium Grown Teas 69, Low Grown Teas 63.

Coffee.—Liberian coffee was quoted throughout the month at \$14.50 per picul, Excelsa at \$10.50, and Robusta at \$6.50.

Singapore prices declined in December, Sourabaya coffee averaged \$10.20 to \$9.10, and Palembang coffee from \$12.30 to \$11.25 per picul, these being averages of highest and lowest quotations.

Spices.

Arecanuts.—The average of Singapore Chamber of Commerce quotations per picul were: Best \$7.45, Medium \$7.10, Mixed \$6.40, as compared with \$7.81, \$7.44 and \$6.56 in November.

The average of highest and lowest quotations per picul in Singapore were as follows:— Splits \$7.25 to \$4.75; Red Whole \$6.80 to \$5.55; Sliced \$9.35 to \$6.90; as compared with \$6.65 to \$4.87, \$6.69 to \$5.12 and \$10.75 to \$7.50 per picul respectively in November. The price within these ranges depends on quality.

Pepper.—Singapore Black was quoted throughout the month at \$8 per picul. Singapore White dropped at the end of the month 25 cents to \$11.50 per picul, and Muntok White a similar drop to \$11.75. The average prices of these grades respectively were \$11.70, and \$11.95 per picul.

Nutmegs.—Prices for both 110's and 80's remain at \$28 per picul. The Penang market price was \$18 per picul.

Mace.—Nominal prices in Singapore were, Siouw \$80 per picul, Amboina \$60 per picul. The Penang price was \$70 per picul.

Cloves.—Both Zanzibar and Amboina cloves were quoted, nominally, in Singapore at \$40 per picul. In Penang, harvesting continued at 4 cents per kati, weather was favourable for drying, and the price for the very best quality is reported to have reached \$50 per picul.

Cardamoms.—The price of green cardamoms as quoted in *The Ceylon Chamber of Commerce Weekly Report* for 19th December 1938 was from Rs.1.05 to Rs.1.18 per lb.

Miscellaneous.

Derris.—The average Singapore prices in December were as follows: for root sold on basis of ether extract \$8 to \$10 per picul; for root sold on basis of rotenone content \$17 to \$19 per picul. The market was quiet, with very little demand.

Gambier.—Block gambier was quoted in Singapore at \$7 per picul (nominal) and Cube No. 1 at \$15 per picul.

Sago.—In Singapore, the price for Pearl sago was \$3.70 throughout the month. Flour Sarawak Fair tended to improve in price, quotations during the month being from \$2.07½ to \$2.17½ per picul, the average price for the month being \$2.13. Average prices in November were \$3.77 and \$2.18 respectively.

Tapioca.—Flake fair dropped 20 cents to \$3.90, the average price being \$3.95, as compared with \$4.10 in November. Seed Pearl and Pearl Medium remained at the November level of \$3.90 and \$4.50 per picul respectively.

Tobacco.—Prices showed no material variation over those ruling in November. The three grades were quoted at \$35, \$29 and \$20 per picul respectively in Penang, in Kedah at \$35, \$25 and \$14. Grade I in Malacca was from \$20 to \$24 per picul, while in Pahang North the three grades were per picul \$18 to \$35, \$13 to \$15 and \$5 to \$10. The usual high prices ruled in Kelantan, and the usual wide variation in price according to district and grade of tobacco in Johore. In Labuan the price was from \$80 to \$70 per picul.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm Oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co., Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY. *

November, 1938.

Malaya.—The imports of foreign rice during November were 60,491 tons,† exports were 17,151 tons; net imports were therefore 43,340 tons as compared with 60,443 tons in October.

Gross imports for the first eleven months of 1938 were 752,477 tons, exports were 180,800 tons, net imports being 571,677 tons as compared with 531,703 tons during the corresponding period of 1937.¶

Of the imports during November, 50 per cent. were consigned to Singapore, 16 per cent. to Penang, 7 per cent. to Malacca, 17 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 44,726 (73.9), Burma 14,035 (23.2), French Indo-China 496 (0.8), elsewhere 1,234 (2.1).

Of exports during November, 74 per cent. were consigned to the Netherlands Indies and 26 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 14,001 (81.6), Burma 2,557 (14.9), French Indo-China 515 (3.0), parboiled rice 52 (0.3), Malayan 26 (0.2).

Net imports of rice during November, by countries of origin were, in tons:—Siam 30,725, Burma 11,478, French Indo-China 19, elsewhere 1,156.

India.—Foreign exports of rice, January to October 1938 were 226,000 tons, as compared with 657,000 in 1937, a decrease of 65.6 per cent.

Of these exports 2.2 (3.9) per cent. were to the United Kingdom, 3.5 (5.8) per cent. to the Continent of Europe, 38.1 (29.1) per cent. to Ceylon, 4.9 (21.6) per cent. to the Straits Settlements and the Far East, and 51.3 (39.6) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

Burma.—Foreign exports of rice from 1st January to 23rd November 1938 were 2,907,477 tons, as compared with 2,990,957 tons in 1937, a decrease of 2.8 per cent. Of these exports, 40.4 (44.1) per cent. were to India, 11.2 (9.5) per cent. to the United Kingdom, 9.6 (10.2) per cent. to the Continent of Europe, 12.0 (11.6) per cent. to Ceylon, 14.6 (14.5) per cent. to the Straits Settlements and the Far East, and 12.2 (10.1) per cent. to other countries. The figures in brackets refer to the corresponding period of 1937.

Average November prices in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 204, Small Mills Specials 215.

According to the second forecast of the rice crop in Burma for the year 1938-39, the area likely to mature is estimated at 12,695,900 acres, an increase of 0.8 per cent. as compared with the final figures for last year. The season has been so far a very satisfactory one and unless something unforeseen occurs, the prospects of the crop are very favourable.

* Abridged from the Rice Summary for November, 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout this Summary, that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

Siam.—Exports of rice and rice products from Bangkok during September were 92,151 tons, giving a total of 1,141,233 tons for the first nine months of 1938 as compared with 720,402 tons in 1937.

The latest report from 60 provinces (end of October) states that the area sown totals 7,185,391 acres; at the same time last year 7,270,888 acres were given as cultivated area. About 455,057 acres have been reported damaged as compared with 614,865 acres last year. About 90 per cent. of the damage is due to flood.

Japan.—The second estimate of the 1938 rice crop of Japan (end of October) is reported at 8,988,512 tons, representing a decrease of 93,966 tons, or 1 per cent. as compared with the first estimate.

The rice stocks of Japan on 1st November, the opening of the present rice season, amounted to 1,191,015 tons, an increase of 137,477 tons, or about 13 per cent. over the corresponding date in 1937.

On the basis of the second crop prediction and the actual stocks of rice on 1st November, the supply and demand of rice for the present rice year are estimated as follows:—

Supply:	tons	Demand:	tons
Stocks brought forward		Estimated consumption ...	11,150,000
from previous season ...	1,191,000	Estimated exports	
Production ...	8,989,000	abroad ...	10,000
Estimated imports from		Estimated exports to	
abroad ...	42,000	colonies ...	72,000
Estimated imports from			
colonies ...	2,040,000		
	<hr/>		<hr/>
	12,262,000		11,232,000

Rice stocks on 31st October, 1939, the next between-season 1,030,000 tons.

French Indo-China.—Entries of padi into Cholon from 1st January to 15th November were 921,778 tons, as compared with 1,315,186 tons in 1937, a decrease of 29.9 per cent. Exports of rice during this period were 1,000,851 tons, as compared with 1,387,806 tons in 1937, a decrease of 27.9 per cent.

The Saigon rice report for October 1938, states that the firmness noted in prices of rice and padi after the international détente was not maintained in October. The rice market showed little activity, and demand was for shipment only. Prices weakened constantly, particularly in the second fortnight, falling from \$3.55 per picul on the 1st to \$3.50 on the 15th and to \$3.39 at the close of the month.

Arrivals of padi were slight and the market inactive. Prices weakened from \$2.31 per picul to \$2.27 in mid-month and \$2.24 on the 31st.

Netherlands Indies.—The latest information available was published in the Summary for October, 1938.

Ceylon.—Imports of rice for the first eleven months of 1938 were 491,617 tons, as compared with 480,206 tons in 1937, an increase of 2.3 per cent.

Of these imports 18.1 (17.1) per cent. were from British India, 68.6 (70.2) per cent. from Burma, 0.2 (0.1) per cent. from the Straits Settlements and 13.1 (12.6) per cent. from other countries. The figures in brackets are for the corresponding period of 1937.

Europe and America.—Shipments of rice from the East to Europe from 1st January to 10th November were 1,117,500 tons, as compared with 1,029,460 tons in 1937, an increase of 8.6 per cent.

Of these shipments, 40.7 (41.2) per cent. were from Burma, 47.3 (52.9) per cent. from Saigon, 10.8 (4.2) per cent. from Siam, and 1.2 (1.7) per cent. from Bengal. The figures in brackets are for the corresponding period of 1937.

Shipments for the Levant from 1st January to 26th October were 28,336 tons, as compared with 16,128 tons in 1937, an increase of 75.7 per cent.

Shipments for Cuba, West Indies and America from 1st January to 21st October were 165,909 tons, as compared with 213,141 tons in 1937, a decrease of 22.2 per cent.

MALAYAN AGRICULTURAL EXPORTS, OCTOBER, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Oct. 1937	Jan./Oct. 1938	October 1937	October 1938
Arecanuts ...	30,084	24,751	28,268	1,510	342
Coconuts fresh ...	95,223†	79,322†	88,612†	9,835†	11,705†
Coconut oil ...	39,762	32,950	38,791	3,429	5,217
Copra ...	75,592	56,796	50,589	6,625	12,710
Gambier, all kinds ...	1,955	1,645	1,332	109	123
Copra cake ...	15,026§	12,505	5,369	1,495	365
Palm kernels ...	7,312	5,418	7,269	777	977
Palm oil ...	42,787	35,539	47,018	4,460	5,019
Pineapples, canned ...	80,502	71,539	64,609	2,765	4,622
Rubber ...	503,127¶	409,764¶	335,653¶	42,872¶	24,233¶
Sago,—flour ...	15,478	13,116	3,625	2,719	229
„ —pearl ...	3,759	3,119	3,567	556	386
„ —raw ...	8,256*	6,803*	4,330*	852*	310*
Tapioca,—flake ...	1,058	924	791	86	104
„ —flour ...	2,393*	1,849*	2,623*	171*	233*
„ —pearl ...	18,786	14,021	15,079	1,170	1,638
Tuba root ...	573	515	494	35	87

† hundreds in number.

* net imports.

¶ production.

§ gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938		Palm Oil		Palm Kernels	
		F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	...	2,241.7	1,309.2	383.7	232.0
February ...	...	2,040.4	1,457.1	370.4	261.0
March ...	...	2,359.6	1,843.1	446.8	344.0
April ...	...	1,963.7	1,122.6	353.6	218.0
May ...	...	1,491.7	1,480.7	274.8	253.0
June ...	...	1,773.5	1,781.2	315.9	247.0
July ...	...	2,546.5	2,134.2	450.8	311.0
August ...	...	3,537.4	2,798.1	537.8	437.0
September ...	...	3,415.9	1,779.2	591.4	289.0
October ...	...	2,817.9	2,056.3	483.0	304.0
November ...	...	2,451.6	1,934.3	450.1	297.0
Total ...	...	26,639.9	19,696.0	4,708.3	3,198.0
Total January to November, 1937 ...	...	25,430.9	16,282.2	4,572.4	2,569.2
Total for the year 1937 ...	...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 30th November, 1938, were palm oil 2,377 tons, palm kernels 632 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH NOVEMBER, 1938.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (2)	Actual area tapped during the month Acreage (3)	Percent- age of (3) to (2) (4)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED						AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7) + (9) (13)	Percent- age of (13) to (2) (14)
				ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		On estates which have partly ceased tapping		Under rotational systems		Acreage (11)	Percent- age of (11) to (2) (12)		
				Acreage (5)	Percent- age of (5) to (2) (6)	Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)				
S. S.—													
Province Wellesley ...	43,335	19,386	44.7	932	2.2	14,861	34.3	8,156	18.8	443	1.0	23,949	55.3
Malacca ...	121,444	55,594	45.8	5,097	4.2	32,600	26.8	28,153	23.2	2,070	1.7	65,850	54.2
Penang ...	2,478	1,205	48.6	nil	nil	1,213	49.0	60	2.4	9	0.4	1,273	51.4
Singapore ...	32,234	15,026	46.6	4,677	14.5	8,165	25.3	4,366	13.6	115	0.4	17,208	53.4
Total S.S. ...	199,491	91,211	45.7	10,706	5.4	56,839	28.5	40,735	20.4	2,637	1.3	108,280	54.3
F. M. S.—													
Perak ...	285,505	152,033	53.3	9,634	3.4	72,889	25.5	50,949	17.8	6,990	2.4	133,472	46.7
Selangor ...	321,157	193,410	60.2	6,059	1.9	59,046	18.4	62,642	19.5	6,849	2.1	127,747	39.8
Negri Sembilan ...	256,020	135,810	53.0	9,729	3.8	61,021	23.9	49,460	19.3	7,103	2.8	120,210	47.0
Pahang ...	86,620	42,463	49.0	7,532	8.7	25,010	28.9	11,615	13.4	6,672	7.7	44,157	51.0
Total F.M.S. ...	949,302	523,716	55.2	32,954	3.5	217,966	22.9	174,666	18.4	27,614	2.9	425,586	44.8
U. M. S.—													
Johore ...	477,187	262,176	54.9	21,211	4.5	124,612	26.1	69,188	14.5	33,731	7.1	215,011	45.1
Kedah ...	199,612	110,169	55.2	9,440	4.7	36,570	18.3	43,433	21.8	6,142	3.1	89,443	44.8
Kelantan ...	31,333	18,224	58.2	403	1.3	7,531	24.0	5,175	16.5	2,383	7.6	13,109	41.8
Trengganu (b) ...	4,817	3,037	63.0	nil	nil	97	2.0	1,083	35.0	74	1.5	1,780	37.0
Perlis (c) ...	1,371	621	45.3	262	19.1	354	25.8	134	9.8	75	5.5	750	54.7
Brunei ...	5,746	2,471	43.0	nil	nil	2,601	45.3	674	11.7	255	4.4	3,275	57.0
Total U.M.S. ...	720,066	396,698	55.1	31,316	4.3	171,765	23.9	130,287	16.7	42,660	5.9	323,368	44.9
Total MALAYA ...	1,868,859	1,011,625	54.1	74,976	4.0	446,570	23.9	335,688	18.0	72,911	3.9	857,234	45.9

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).

(b) Registered companies only.

(c) Figures for the quarter ending 30th September, 1938.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF NOVEMBER, 1938 IN DRY TONS.

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State or Territory	Stocks at beginning of month 1			Production by Estates of less than 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports			Exports including re-exports			Stocks at end of month			Consumption 3			
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Nov. 1938	during the month	Jan. to Nov. 1938	during the month		January to Nov. 1938		during the month		January to Nov. 1938		Dealers		Estates of 100 acres and over		
								Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local					
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Federated Malay States	...	8,059	21,716	10,493	119,626	1,878	51,766	Nil	Nil	Nil	Nil	8,894	3,300	127,604	39,155	...	6,047	23,887	18	179
States	...	2,135	8,503	4,226	53,661	1,754	30,298	Nil	71	Nil	370	2,015	3,828	125,271	52,877	...	2,032	8,800	...	...
Johore	...	260	4,743	2,346	28,991	622	8,903	Nil	Nil	Nil	Nil	1,205	1,381	17,597	19,041	...	191	5,194	...	...
Kedah	Nil	Nil	Nil	Nil	Nil	27	Nil	336	...	...	...	...	...
Perlis	Nil	Nil	Nil	Nil	Nil	27	Nil	336	...	...	...	...	...
Kelantan	Nil	Nil	Nil	Nil	290	372	3,051	7,033	...	399	666	...	...
Trengganu	Nil	Nil	Nil	Nil	Nil	215	5	4,024	...	...	26	281	...
Brunei	93	...	1,182	...	...	7	81	...
Total Malay States	...	11,088	435,959	17,482	209,370	4,705	99,543	Nil	71	Nil	370	12,404	9,211	178,551	123,648	...	8,733	38,940	18	179
S. SETTLEMENTS:—	...	2,189	1,993	943	11,637	378	5,391	Nil	Nil	Nil	Nil	1,649	...	24,678	...	...	1,726	2,132	...	...
Malacca	...	2,512	836	385	4,392	125	2,173	Nil	Nil	Nil	Nil	6,079	...	79,113	...	...	1,503	917	...	...
Province Wellesley	...	1,186	4,929	14	15	190	814	2,172	3,198	27,586	124,917	19,258	...	211,668	...	...	2,055	4,066	15	...
Penang	...	5,132	23,663	276	100	1,490	53	8,007	120,399	515	...	...	...	...	...	...	3,386	21,761	291	34
Singapore	40	...	...	...	...	...	...	...	...	...	...	...	...
Labuan
Total Straits Settlements	...	6,318	33,320	3,119	17,709	607	9,036	10,219	8,198	148,494	124,917	26,935	...	315,459	...	...	5,441	29,082	3,355	34
Total Malaya	...	6,318	144,408	18,996	227,079	5,312	108,576	10,219	8,269	148,494	125,287	39,340	9,211	494,010	123,648	...	5,441	37,815	42,295	52

†Exports of rubber from F.M.S.

*Ocean Shipments from Malaya of rubber directly consigned from F.M.S.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federation of Malay States		S'ore	Penang	Province of Wellesley	Johore	Kedah
	23	24	25	26	27	28	
DRY RUBBER	5,303	22,206	3,938	3,036	1,690	95	
WET RUBBER	745	565	128	166	362	96	
TOTAL	6,047	21,761	4,066	3,202	2,052	191	

TABLE III
FOREIGN EXPORTS

PORTS	For month		Jan. to Nov. 1938
	29	30	31
Singapore	...	27,154	330,596
Penang	...	8,821	116,179
Port Swettenham	...	3,176	45,015
Malacca	...	189	2,226
MALAYA	...	39,340	494,010

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month		Jan. to Nov. 1938
	22	23	24
Malay States	...	21,532	209,114
Straits Settlements	...	1,385	25,341
MALAYA	...	23,417	324,455

- Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production = Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, i.e., Column [13] = Columns [13] + [14] + [15] + [16] + [17] + [18] + [19] + [20] + [21] + [22] + [23] + [24] + [25] + [26] + [27] + [28] + [29] + [30] + [31]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd December, 1938.

METEOROLOGICAL SUMMARY, MALAYA, NOVEMBER, 1938.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL							BRIGHT SUNSHINE.				
	Means of			Absolute Extremes			At 1 foot	At 4 feet	Total.	Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.			
	A.	B.	Min.	Max.	Highest Max.	Lowest Min.					Highest Max.	Lowest Min.	Precipitation in or more	Thunder- storm				Fog morning obs.	Gale force 8 or more	
							°F	°F	°F	°F					°F	°F	in.			mm.
		°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.	mm.	in.	mm.	hrs.	hrs.			
Railway Hill, Kuala Lumpur, Selangor	88.7	72.1	80.4	93	69	82	75	83.4	84.5	4.30	109.2	1.37	16	12	—	3	—	160.05	5.33	44
Bukit Jeram, Selangor	88.1	71.9	80.0	92	70	79	75	83.6	85.8	7.60	193.0	1.71	16	13	1	1	1	187.90	6.26	52
Sitiawan, Perak	87.6	72.6	80.1	90	65	79	76	83.4	84.3	6.73	170.9	2.42	12	11	—	—	—	171.80	5.73	48
Ipoh Aerodrome, Perak	88.4	71.9	80.1	92	67	78	75	82.7	83.9	7.46	189.5	1.28	15	12	4	—	—	170.00	5.67	47
Tenerloh, Pahang	88.0	72.4	80.2	92	70	81	74	84.5	86.2	3.85	97.8	0.92	18	14	2	5	—	134.85	4.49	37
Kuala Lipis, Pahang	87.9	71.0	79.5	91	68	78	73	83.0	84.4	17.75	450.9	2.39	21	18	4	18	1	159.50	5.32	45
Kuala Pahang, Pahang	84.5	74.0	79.3	89	71	78	79	83.0	85.6	10.22	259.6	3.20	18	16	2	—	—	157.40	5.25	44
Kallang Aerodrome, Spore	85.9	74.5	80.2	89	71	78	77	81.9	83.2	6.44	163.6	1.98	20	15	5	—	1	138.85	4.63	38
Bayan Lepas Aerodrome Penang	86.0	73.5	79.7	89	67	78	76	83.1	84.1	5.41	137.4	1.08	14	13	3	—	—	183.55	6.12	52
Malacca Town, Malacca	84.6	73.3	78.9	87	71	79	76	82.3	84.0	7.51	190.8	1.35	18	13	5	—	5	156.20	5.21	43
Kluang, Johore	87.3	71.8	79.5	91	69	77	73	81.7	82.5	9.72	246.2	1.98	20	20	6	8	1	135.45	4.51	38
Mersing, Johore	85.0	72.1	78.5	91	70	78	75	81.2	82.1	14.65	372.1	5.15	18	13	2	—	2	138.80	4.63	39
Alor Star, Kedah	86.6	72.5	79.5	91	68	74	75	84.5	85.3	6.42	163.1	1.49	14	12	4	3	—	176.20	5.87	49
Kota Bharu, Kelantan	84.0	72.5	78.3	91	70	74	75	81.6	84.1	39.03	991.4	8.27	12	18	3	—	1	167.95	5.60	47
Kuala Trengganu, Trengganu	84.0	72.5	78.3	91	70	74	75	80.4	83.3	35.43	901.2	8.11	19	18	2	—	—	170.25	5.67	48
Labuan	86.0	76.0	81.0	88	73	82	78	83.7	85.8	15.19	385.8	3.98	24	20	—	—	1	201.65	6.72	56
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft	72.0	61.8	66.9	77	60	67	64	70.9	71.8	4.64	117.9	1.38	15	13	—	14	—	128.00	4.27	35
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	70.9	56.2	63.8	73	44	65	62	69.8	70.0	7.19	182.6	1.48	20	16	2	—	1	133.05	4.43	37
Cameron Highlands, Rhodo- dendron Hill, Pahang 5120 ft.	71.4	58.9	65.3	75	55	64	61	*	*	7.66	194.6	1.38	19	16	2	—	1	136.65	4.55	38

* Not recorded.

THE Malayan Agricultural Journal.

FEBRUARY, 1939

EDITORIAL.

Padi Planting Methods.

In this issue we place on record the customary methods of planting padi in different parts of Malaya. The account has been compiled from reports prepared by Agricultural Officers in the areas concerned, who also supplied most of the illustrations. Discussion of the varieties of padi grown in different parts of the country and under varying conditions of cultivation, and the milling of rice are outside the scope of the present article. Malay words of implements used for the various operations of planting are freely scattered throughout the article. While this does not pretend to be an exhaustive list of words in common usage amongst Malays, it is thought that the inclusion of such terms may be of assistance for those whose duties take them amongst padi planters.

In reading this account, one cannot but be impressed by the ingenuity of the planters in evolving implements and methods of cultivation suited to the conditions peculiar to each locality. Furthermore, the Malay cultivator's eye for levels and success in devising methods of irrigation should not pass unnoticed. The time-honoured customary methods used are doubtless capable of improvement, but it has been the experience of officers of the Department of Agriculture that Malay methods of cultivation cannot be lightly brushed aside in favour of modern methods; rather the investigator must introduce innovations with the utmost caution and only after exhaustive trials at local experiment stations.

While this account details the variations in systems to suit local conditions, it is not intended to advocate any of these methods for general or localized application. The system to be established in any new centre of production must be devised to suit local conditions.

The padi cultivator has many difficulties to overcome, and wide experience in the cultivation of other crops is of very limited value when it comes to padi planting. Generations of Malays have planted their ancestral holdings from year to year, and they have thus given their heritage of knowledge and industry to the present-day Malaya, a heritage not only of a countryside beautified by their labours, but the insurance of this country against serious food shortage by the annual supply of about 40 per cent. of the requirements of the staple food of about 98 per cent. of the total population of this country.

Original Articles.

PADI PLANTING METHODS IN MALAYA.

*Compiled by the Economics Branch of the Department of Agriculture, S.S.
and F.M.S., from Reports of Field Officers.*

The variations in customary methods employed in different parts of the country for the cultivation of rice have originated in a large measure by reason of local conditions. Chief amongst these conditions are nature of the soil, distribution of rainfall and adequacy or otherwise of irrigation, topography, and to some extent, the degree to which the planter relies on his padi crop for his livelihood.

Padi planting is essentially a Malay industry. In certain large districts, notably Krian in Perak, harvesting is largely carried out by Indian immigrant labourers working on contract, but elsewhere the cultivation of this crop is a time-honoured Malay industry, and the methods employed to-day the result of very long experience of local conditions. In the days when communication between one district and another was difficult, there could be little exchange of ideas; in more recent years the padi-planters of one area have visited other padi areas and have thereby been able to improve their own methods by taking advantage of the experience of others.

The main areas of padi cultivation in Malaya are Kedah with Perlis, covering about 40 per cent. of the total area, Kelantan about 20 per cent., North Perak with Province Wellesley about 15 per cent, while very much smaller but well defined areas of cultivation are mainly in Trengganu, Malacca, Negri Sembilan and Pahang. In view of this pre-eminence of the first-mentioned States, the methods adopted in these areas will be given more notice than those customary in areas of less importance.

Rainfall.

The average annual rainfall in Kedah is 89 inches, the wettest months being August and September. A fine dry period with strong N.E. winds is experienced from the middle of December to the beginning of March, followed by April rains.

Kelantan experiences rainfall from about July and commencement for the cultivation for the next crop depends on the efficacy or otherwise of these rains on which the cultivators depend to soften the soil sufficiently to allow the plough to penetrate. The main wet period in Kelantan and Trengganu is from October to December.

In the Krian District of Perak and in Province Wellesley the main rainfalls have their peaks in April/June and October/November.

Necessarily, the dates of cultivation of the land and planting of the crop depend very much upon the rains, the object being to prepare the land when it has been softened by rains, to have sufficient water available to irrigate, or flood the land from the time of transplanting until flowering, and to be able to draw off the water

and to harvest during fine weather. The dates of commencement of rains in most parts of the country, however, are so uncertain that many disappointments are experienced, and the crop frequently suffers through unseasonable weather. The improvement of irrigation, therefore, to which many Government schemes have been directed while others are still in hand, may be expected materially to better the lot of the cultivator and to result in increased yields per acre.

Soils.

Soils in which padi is cultivated vary widely, and influence greatly the methods of cultivation. The Kedah areas consist mainly of a deep stiff clay, Krian and Province Wellesley of a heavy clay with a good organic matter content, and the heavy clays are also found in many other areas. In addition, padi is grown on lighter soils, and in water-logged organic soils. Good crops are also found on the inland valley alluvium soils, notably in Negri Sembilan, Selangor and Pahang fed by rivers which wind through the padi areas.

Water Control.

The Krian area in Perak has for many years had the advantage of a controlled drainage and irrigation system, executed and managed by the Government. Other smaller areas have a similar advantage, but in the main, the padi areas in this country are served by rivers, and the Malays themselves have been responsible for the means of harnessing the natural water supply for the irrigation of their fields by such means as brushwood dams and water wheels made mainly from bamboo. Many of these are now replaced by permanent and effective structures erected by the Drainage and Irrigation Department. In water-logged areas, the grower is dependent entirely on local rainfall, and necessarily the area he can plant in any one season depends upon the rainfall in that particular season.

Cultivation.

The nature of the soil and the water supply determine the amount of preliminary cultivation which is possible or necessary and therefore the kind of implements used. The Malay cultivators have devised a number of ingenious implements to serve their purpose of cultivating their land for padi.

Ploughing is possible on most irrigable areas, but in real swamp lands which rarely dry out, the depth and softness of the peaty soil would result in the plough sinking, and in these areas, other methods, described below, have been devised.

The plough usually employed is a light single furrow plough, single shafted, made of wood with an iron share and breast, or it is made entirely of wood except for the share which is shod with iron. It is usually drawn by one buffalo or by two oxen.

Various other implements are used, some fairly generally, others only locally. These are described under the States in which they are found.

Systems of Cultivation.

There are two main systems of padi cultivation, *viz.*: wet system and the dry system, 90 per cent. of the total area being cultivated under the wet system. But there are variations of both these main systems to suit local conditions, wet systems involving considerable preliminary cultivation as opposed to systems where cultivation is practically impossible owing to the soft nature of the land; dry systems which include ploughing and raking, and a dry system which merely entails the clearing and burning the jungle in preparation for the crop.

In the cultivation of "wet" padi the general procedure (of course with local variants) is to plough or dig the land once or twice, and rake and smooth it with a roller. The seed is planted in a nursery and is ready for transplanting in the field after 40 days. The seedlings are planted three or more per hill, about one foot apart. After cultivation consists of weeding.

In dry padi cultivation the land is sometimes ploughed twice, raked and the seed sown by hand or drilled; or seed planted in clumps about a foot apart, or in hill cultivation, virgin land is cleared, burned and the seed broadcast.

Manuring.

Generally speaking, manuring is not a common practice in padi cultivation. In Kedah and Perlis, where bat guano is easily procured, the land is periodically manured. In Kelantan a system exists in which each plant, after transplanting, receives a small application of burnt mixture of cowdung and earth, coconut and arecanut leaves. In parts of Perak and in Province Wellesley and Malacca, the seedlings are steeped in a mixture of mud, phosphate, and ashes immediately after removal from the nursery.

WET PADI PLANTING IN DIFFERENT STATES.

Krian District of Perak.

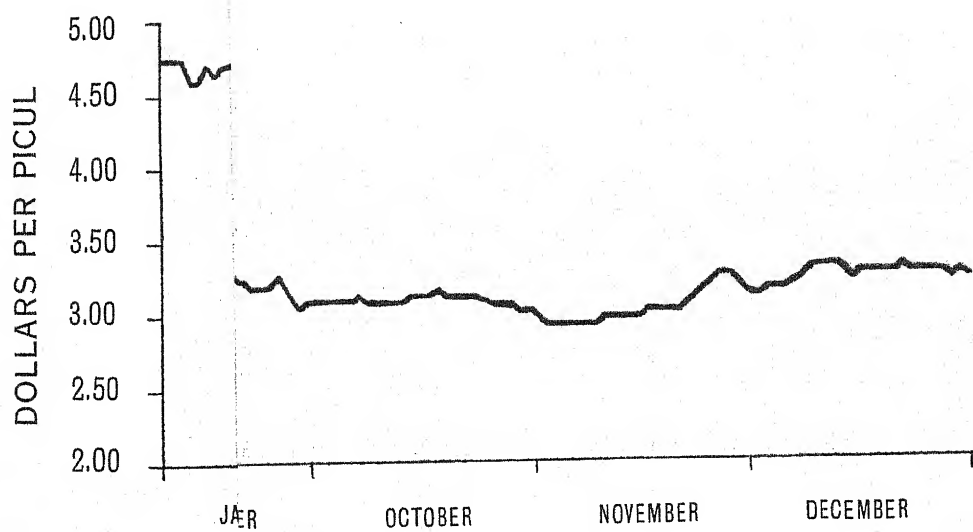
Soils.—The system of padi planting adopted in the Krian irrigation area of Perak—about 50,000 acres—includes features not met with elsewhere. The yields obtained, largely on account of the effectively controlled irrigation system and the good soil, are amongst the highest in Malaya.

The soils of the Krian irrigation area are of three main types: (i) blue grey clays with overlying deposits of rich alluvium; (ii) mottled reddish-grey clays and (iii) peats.

The coastal portion of the Krian District at one time formed part of a wide alluvial mangrove swamp. The soils are blue-grey clays, heavy in texture and overlaid by deposits of alluvium of varying depths. These soils are rich in essential plant nutrients and are capable of producing extremely heavy crops of padi. The reddish-grey clays constitute the higher land areas. They are capable of carrying good crops provided that irrigation facilities are adequate. The low-lying peat areas—peat of various depth overlying a clay subsoil—present difficulties in drainage and cultivation and produce poor crops.

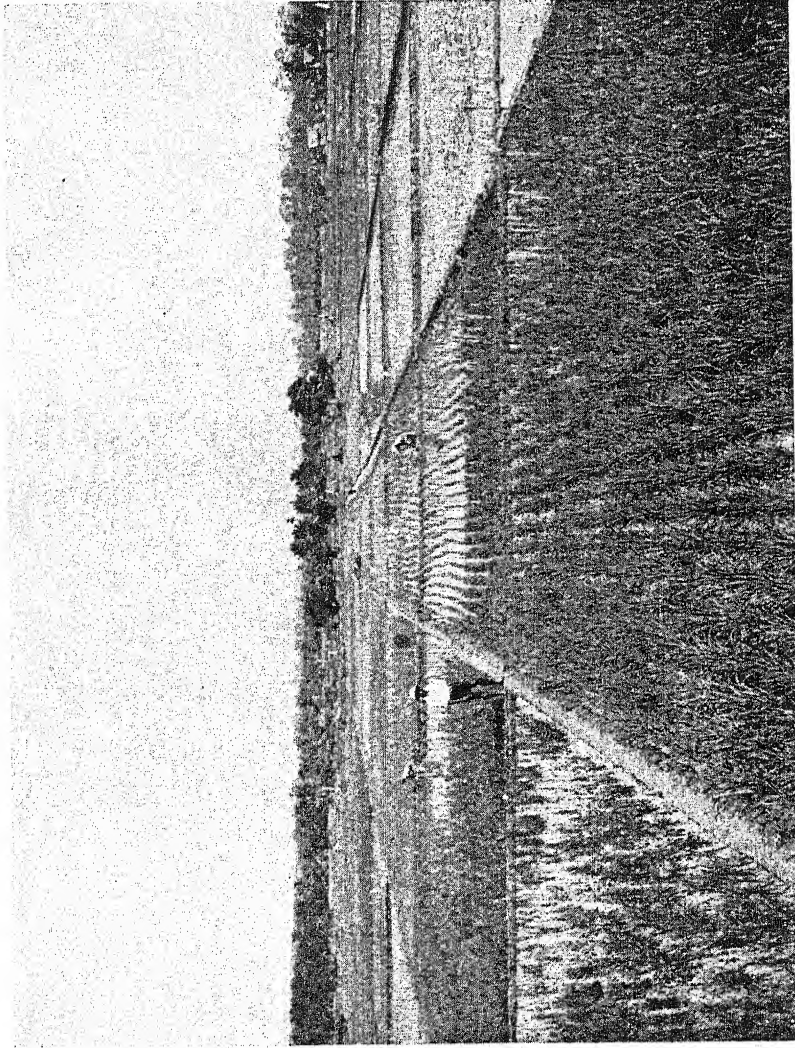
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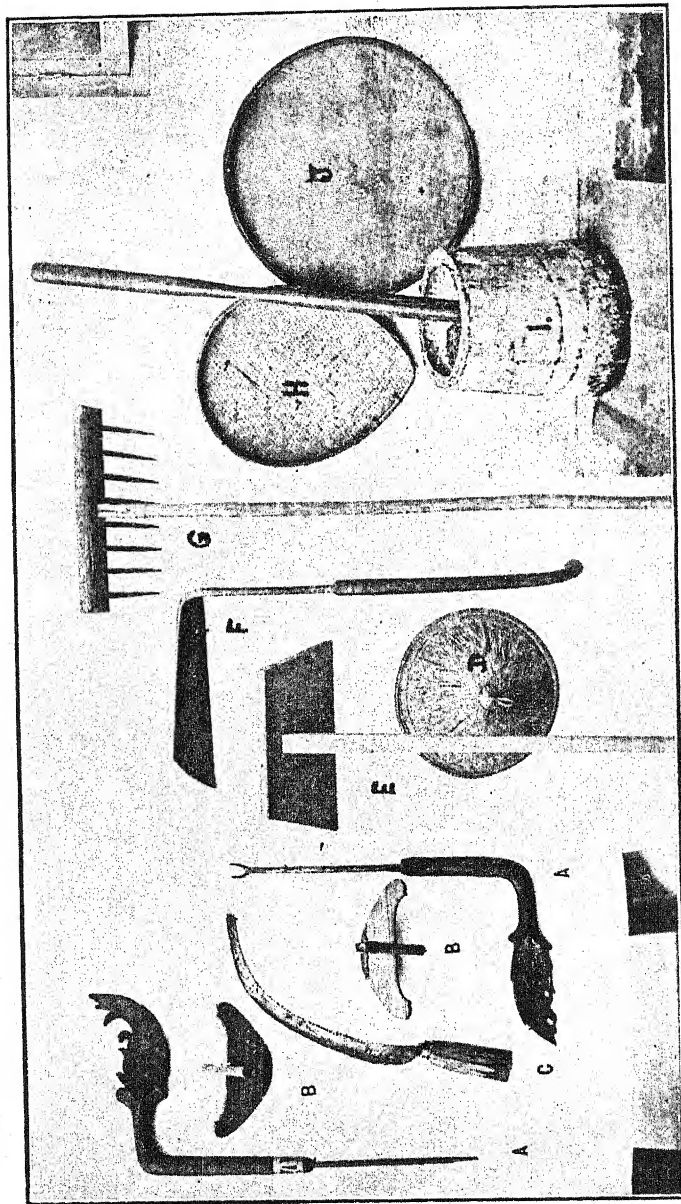


K. P. & CO., LTD., K. L.

Systems of Cultivation



Field Planted with Wet Padi.



Implements used in Padi Cultivation.

- | | | | |
|------------------|-------------|-----------|------------------------|
| A. Kuku Kambing. | D. Sun Hat. | G. Sikat. | I. Lesong Tangan. |
| B. Pisau Menuai | E. K'ais. | H. Niru. | J. Intau (Rice Sifter) |
| C. Sabit | F. Tajak | | |

Nurseries.—The Krian system is that of a wet nursery with multiple transplanting. The number of transplantings varies; in the coastal areas three transplantings are carried out, while two are usual in the higher lands.

A "floating" seed bed (*rakit*) is prepared by cutting down the fallow weed growth and piling it in a long strip, 3 to 4 feet wide, until the pile stands an inch or two above water level. On this foundation, sufficient clay is plastered to make the whole into a compact bed, on the top of which a thin layer of mud, rich in organic matter, is placed. Should the level of the water in the field rise, the nursery rises and thus maintains its surface above water level.

The normal seed rate is 2 to 5 gallons per acre, depending on the fertility of the soil. The seed is soaked in water for about 3 days (*merendam*) and maintained in a moist condition for a further period of 2 days (*mengering*), during which time it germinates. The germinated seed is then broadcast (*menabor*) thickly and evenly on the seed-bed. The bed is then protected from birds and the sun by a layer of leaves, which is removed after about 7 to 10 days. About 2 days later the young plants, now about 6 to 8 inches in height, are pulled up in clumps of 150 to 200, and with the soil adhering to their roots, are placed in the field so that their stems stand in a few inches of water (*menurun*).

The second transplanting (*meredeh*) takes place some 10 days later, each large clump of 150 to 200 seedlings being sub-divided into about 10 to 12 smaller clumps and transplanted in rows, each clump occupying some 2 square feet of space. The seedlings remain in this nursery (*perdeh*) for approximately 40 days, after which final transplanting in the field takes place.

Preparation of the Land.—Irrigation usually commences a few weeks before the scheduled time for sowing nurseries, with the result that, when operations for the season commence, the land is normally inundated to a depth of from 2 inches or more.

In clearing the fields, the fallow vegetation is cut down by means of an implement (*tajak*) resembling a short-bladed scythe. It is swung from above the shoulder in a downward sweep, so that the vegetation is cut at, or slightly below, ground level. The clearing of the land, which commences after the nurseries have been put down, is often carried out on a co-operative basis (*berderau*). The cut vegetation lies *in situ* to rot down as far as possible and after about a fortnight is raked (*melonggok*) into heaps or long lines further to facilitate rotting.

From 4 to 6 weeks after cutting, the land is cleared by raking the heaps to the edge of the field where they are piled to construct the division bunds (*batas*) between fields, or the rotted growth is scattered throughout the field (*mengechar*) and incorporated into the soil.

The burning of stubble is sometimes met with in Krian as a preliminary measure in clearing the fields.

Planting in the Field.—The seedlings are pulled from the nursery by men who cut off the top 6 to 8 inches of leaves and prune the roots. Planting (*menanam*) is carried out almost exclusively by women, who dibble in the seedlings by means of

an implement (*kuku kambing*) consisting of an iron rod 12 to 15 inches long, with a wood handle and provided with two prongs of about 1 inch in length set about half an inch apart and at an angle of about 30°.

Cultivation after Transplanting.—In rich soil areas, the young padi plants make rapid growth and quickly form a canopy under which weeds fail to thrive. The usual number of weedings carried out varies from one to three, more frequent weeding being necessary on the poorer types of soil.

Drainage of water from the fields is carried out gradually once flowering has become general. Complete drainage takes place once the grain has "set" and ripening commences.

Between planting and harvest, in many places, the bunds dividing fields are planted with vegetable and other food crops. The owners employ their time in planting such crops, and in such occupations as fishing and rubber tapping—often to the neglect of their padi crop.

Harvesting.—In the best areas, it is usual to sow varieties of padi which take from 7 to 8 months to mature. The nurseries are laid down about June so that the harvest is timed to coincide with the short dry season which falls early in the year, generally in February.

The crop, provided it has ripened evenly and has not suffered extensive lodging due to rain or strong winds, is normally reaped with a serrated sickle (*sabit*). About 2 feet of straw carrying the ears is cut and laid to dry in loose sheaves, on the stubble. When dry, the sheaves are bound loosely with straw and carried to a large open tub, some 4 feet wide and 3 feet deep, inside which rests a short ladder with rungs about 4 inches apart. The sheaves are beaten (*memukul*) four or five times against the ladder, causing the grain to be separated and to fall into the tub, the straw being then discarded.

To harvest an unevenly ripened or lodged crop, a small knife (*pisau manual*) is employed with which each ear is harvested separately. This small knife consists of a short narrow blade attached to the convex side of a thin wooden crescent-shaped base, and is held in the palm of the hand. In threshing a crop cut in this manner, bundles of ears are laid on grass mats and the grain trodden out by men.

Winnowing (*mengangin*) is effected by means of a circular tray-shaped basket (*nyiru jarang*) about 2 feet in diameter and of half inch mesh, suspended by strings from a tripod of stout bamboo poles rather more than 6 feet long. The dried padi is placed on this basket-sieve which is gently rocked from side to side so that the padi steadily falls through. The wind carries the dust and empty husks beyond a matting placed below the tripod to receive the padi falling through the sieve. This sieving is repeated once or twice and the cleaned padi transferred to storage bins or bagged for sale.

Province Wellesley and Penang.

The padi area in Province Wellesley is a continuation of that of Krian, but soil conditions are different in areas further removed from Krian. That is to say, the land near Krian is of the same deep nature as the Krian land, which does not

permit of the use of the plough. Similar conditions exist in Penang Island; for these areas the *tajak* is employed to the exclusion of the plough.

The greater part of the padi area in Province Wellesley, however, consists of alluvial valleys or flats, where the soil is sufficiently firm to allow a plough to be used.

Water Supply.—With the exception of Sungei Acheh (within the Krian irrigation area) and the Sungei Kulim, Tasek Junjong and Kubang Semang areas in Province Wellesley and areas on Penang Island where irrigation facilities have been provided, all padi lands in Province Wellesley rely entirely on the retention of rainfall for water supply; consequently, during periods of excessive rainfall, flooding occurs in many districts. Alternatively, during droughts there is an insufficiency of water for the successful cultivation of the crop.

Nurseries.—Where the soil is deep the Krian system of nursery beds is used, and the seedlings are transplanted twice before being planted in the field.

When the padi land is of a shallow nature, the nursery site is chosen where water is readily available. The land is cleaned with *tajak* and is afterwards ploughed, or sometimes dug with a *chaukol*. This work is done when the land is in a moist condition. After this partial cultivation, water is run into the nursery for a few days. The water is then run off and the final operation of levelling effected by dragging a float over the surface. This float usually consists of the stem of a banana plant, or a round log of wood.

The seed is germinated before sowing (as described under the Krian system). From 3 to 3½ gallons of seed are sufficient to plant one acre of land and a nursery bed of about 1/40th acre easily accommodates this quantity of seed.

When the seed is broadcast, the soil is in a damp condition, but as the seedlings develop, water is run into the nursery bed to a depth of about an inch.

The period of time during which the seedlings are maintained in the nursery depends solely upon the maturation period of the particular variety of padi; 30 to 35 days being the usual period for a 5 months' maturation variety, 44 days for a 6 months' maturation variety, and 60 days for varieties which take more than 7 months to mature.

Cultivation.—As stated above, the deep soils are cultivated with the *tajak* as in Krian; but such land constitutes only a little more than 10 per cent. of the total area under the crop in this Settlement. Elsewhere the plough is used. In the plough areas, weeds are usually abundant and this fallow vegetation is first cut down by *tajak* a few inches above ground level, permitted to dry and then burnt; or if the weather is wet the vegetation is allowed to rot.

After the first rains have fallen, about the end of May or early June and when the land has become softened, ploughing is commenced. In seasons of adequate water supply, a single ploughing suffices, but when first rains are followed by a period of dry weather, a second ploughing is often deemed necessary. The land is then harrowed. The effect of the harrow is to break surface clods and level the area, as well as to puddle the soil to the desired consistency. The implement is 3 feet 8 inches broad, and has 12 tines each 1 foot long and spaced 4 inches apart.

During the operation of this implement the roots of weed growth are collected by the harrow and left in heaps when the tines are released from the soil which the operator does by lifting it clear. The mass of roots is allowed to decompose for about a week when a second harrowing is done. The field is then rolled by means of an implement 6 feet long, which has 6 flutes, each 4 inches deep. The roller is carved from a single log of wood, the draught, as for the harrow, being a water buffalo. The roller reduces the surface soil into a fine well-puddled condition. Rolling is often omitted.

Transplanting.—Transplanting in the prepared field is done by women, usually by dibbling in with the implement *kuku kambing* (see under Krian), or by hand in very soft soil, when a bunch of 3 or 4 seedlings is held by the base and thrust into the mud with the thumb of the right hand. In a few very hard areas, a wooden dibble (*chekam*) is used.

Weeding.—The general practice in Province Wellesley and Penang is that in areas where weeds are present, they are removed by hand one month subsequent to transplanting, and a second round of weeding is sometimes carried out one month later.

Harvesting.—Dates for the commencement of harvesting vary in the several divisions of the Province and Penang, Province Wellesley North commencing during late December or early January, Province Wellesley Central during late January or early February, and Province Wellesley South and Penang Island during the month of February.

In areas where belief in the "spirit of the crop" is adhered to, or where uneven maturity occurs, the crop is cut ear by ear with the small knife held in the palm of the hand, known here as *renggam*, but further south as *pisau menuai* (see under Krian). The ears with about 10 inches of straw are tied in bundles, sundried and stored in this condition. In the more extensive padi areas, and when even ripening has occurred, the sickle is used, as in Krian.

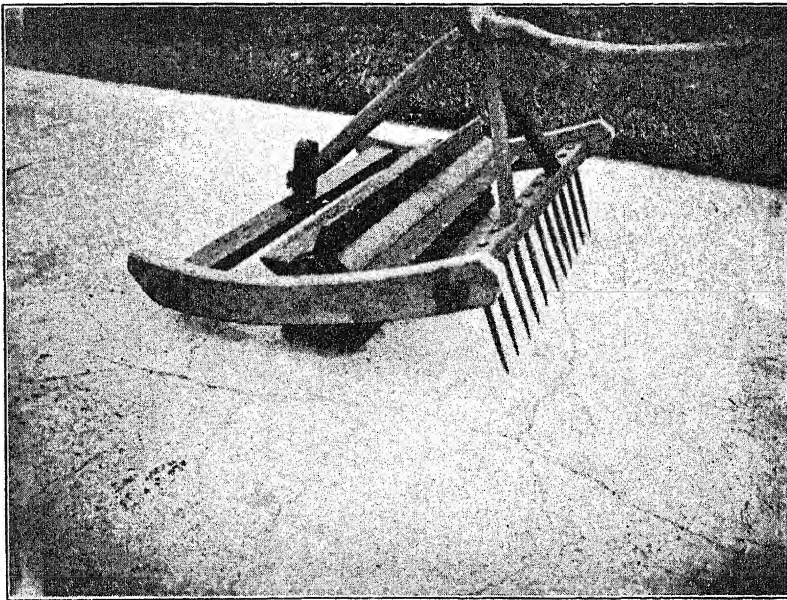
The stubble is generally allowed to decay on the ground and the straw which remains after threshing is heaped and burnt or left to decay.

Dry Rice in Province Wellesley North.

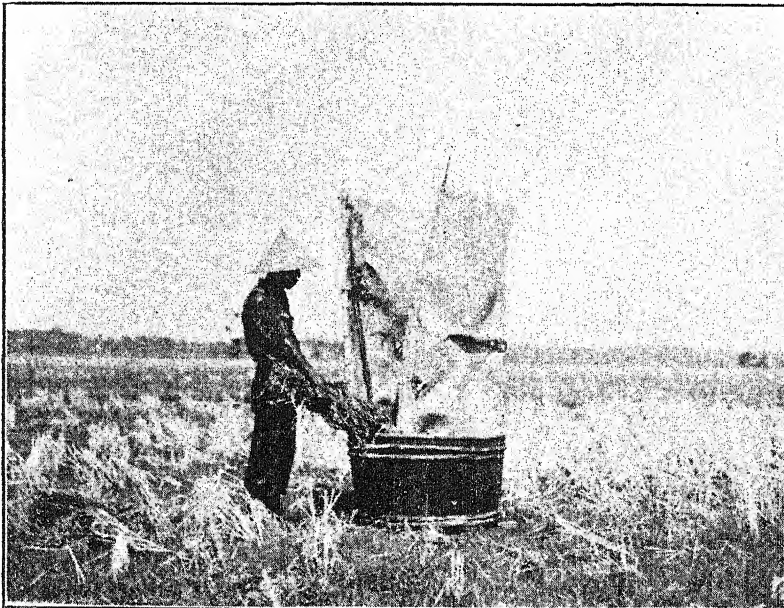
In a few small areas in Province Wellesley North, where dry-land rice is grown, cultivation is commenced in April, as soon as the first rains have fallen. The *tajak* or *parang* is used to clear the vegetation, which is then burnt. Usually no further cultivation is undertaken, but sometimes the land is dug over with a *chankol*.

Male members of the family dibble holes 1 inch deep and 12 to 15 inches apart; they are followed by women who plant 3 or 4 seeds per hole and who then fill the holes loosely with surface soil. At times of labour scarcity, the complete operation is done by women who operate the dibble with the left hand and plant the seeds with the right hand.

Harvesting is performed with the small knife *ranggam*, ear by ear. The ears are tied in bundles, dried and stored.



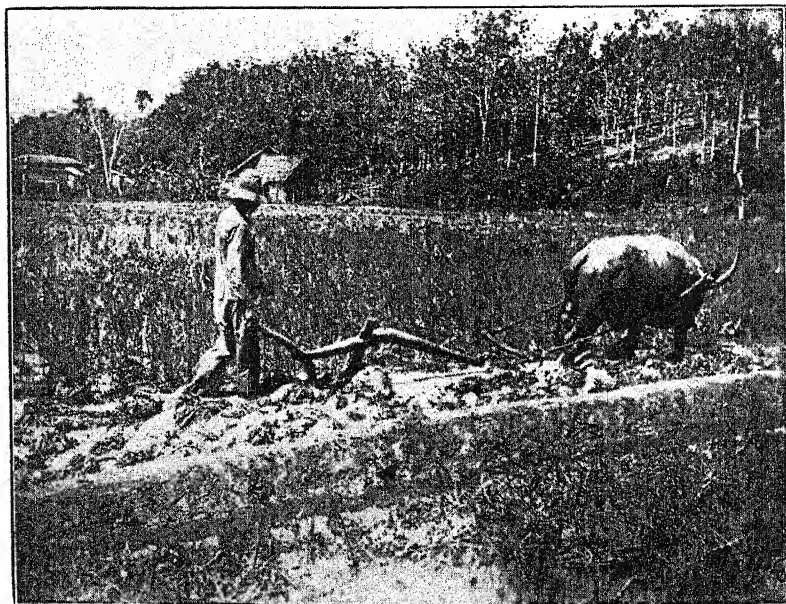
Rake and Roller Combined.



Threshing Tub.



Cultivation with the *Tajak*.



The Malay Wooden Plough.

Kedah.

Kedah possesses one of the largest and most fertile padi growing areas in Malaya. It is mainly situated on a large alluvial plain following the coast, having a total length of 44 miles and a breadth of from 8 to 14 miles.

Soils.—The soil, which is usually several feet deep, consists mainly of a stiff clay, but somewhat lighter clays occur in certain parts.

Water Supply.—The crop is almost entirely dependent on local rains, and the Government has constructed drainage works and canals with the object of combining conservation of rainfall with drainage of the land when required.

Preparation of the Land.—With the advent of rains in April, the small solid bunds around the fields are repaired. It takes several weeks for the land to become flooded after the dry season for during this period the water table may sink to a depth of nearly 10 feet. By the end of May, however, the land is generally workable and cultural operations are commenced.

Cultivation.—The land, on which there are 1 or 2 inches of water, is ploughed and cross-ploughed to a depth of 3 to 4 inches. Weeds are allowed to rot for a period of 3 to 4 weeks and then the land is raked. Raking is continued until all weed growth is destroyed and the surface soil sufficiently broken down. Rolling next takes place and at this juncture it is often necessary to drain off some of the water.

There are certain areas, generally newly opened, where a plough cannot work on account of the soft nature of the soil or the presence of roots. These areas are cultivated with the *tajak* before raking and rolling.

Nurseries.—Nursery beds are made and planted in July and are sited to permit of satisfactory water control.

The seedlings are removed from the nursery at 44 days from planting. The leaves and roots are pruned and if manuring in the field is not practised, the roots may be dipped in bat guano before transplanting. This is done by digging a hole in the ground 1 foot square and 6 inches deep into which a certain quantity of guano is placed and mixed with water to form a thick paste. The seedlings are steeped in this mixture overnight before planting. Seedlings are then planted direct into the field, *i.e.* there is no second nursery.

Bat guano, obtained from local limestone hills, is extensively used, usually at the rate of 1000 lbs. per acre every three years. It is broadcast in the field.

Transplanting.—Transplanting is performed by women either with the fingers, or using the *kuku kambing*, the plants being spaced from 15 to 18 inches apart.

The maturation period of varieties of padi grown in Kedah varies from 5 to 8 months. Short-duration varieties of padi give a smaller yield and are generally planted on light soils where the retention of water is a difficult problem. The longer-term varieties are planted on the deep soils and newly-cleared jungle areas. Varieties with a 6 months' maturation period are the most favoured.

Vacancies are supplied a week or so later and work then ceases until harvest time, with the exception of an occasional weeding by *tajak* or hand.

Water is retained on the land till the plants come into flower, usually early in December, and from then onwards the water is gradually drained off. The grain is ready for harvesting about the middle of January.

Harvesting.—The operations at harvest and the threshing are similar to those described for Krian.

Kelantan.

Almost the entire northern plain in Kelantan is devoted to the cultivation of padi, of which the State contains an area second only to that of Kedah, though from the point of view of production, it occupies only third place amongst other States and Settlements in Malaya.

Two distinct types of padi are cultivated, namely, wet padi or *padi chedongan* and dry padi, *padi tugalan*. This dry padi must not be confused with the dry or hill padi, *padi huma*, found in various parts of Malaya, as the methods of cultivation are distinct.

Wet Padi in Kelantan.

Water-Supply.—Irrigated areas form an insignificant percentage of the whole and the crop is therefore dependent on an adequate and well distributed rainfall during the monsoon. The fact that local soils are of a more porous character than those of other padi growing areas renders the crop more liable to damage by drought and, in addition, the people show very little natural aptitude in taking water from drains and streams, or in utilizing water to its best advantage when it is brought to their fields. A further point militating against high yields is that the State carries a very large stock of cattle and buffaloes for which little grazing accommodation exists; the stock grazes on the padi land during the dry season and, in addition to causing great damage to bunds and water courses, constitutes a very severe drain on the store of plant nutrients in the soil.

Soils.—The cultivation of padi is carried out on two main types of land, the most common of which is lighter in texture than soils usually planted with this crop, and is, moreover, completely dry and baked for six months of the year. The second soil type is entirely organic and occurs in a belt behind the coastal sand bank. Soil of this type is water-logged throughout the year and during the wet weather becomes a morass which trembles beneath one's feet and into which one sinks.

Cultivation.—The date for the commencement of cultivation depends on the efficacy or otherwise of the western rains on which the cultivators depend to soften the soil sufficiently to permit the plough to penetrate. Usually these rains commence in July. Preparation of the land and planting proceed from then until towards the end of November, the low-lying areas being completed first followed by the higher and drier areas, which naturally require a longer soaking before they can be brought to a fit condition for planting.

Where the nature of the land permits, the water is drained off and the fields ploughed and harrowed three times at intervals of ten days. Cultivation is to a depth of $4\frac{1}{2}$ inches and the soil is reduced to a puddled condition. The final harrowing is usually done when the land is flooded.

On the organic types of soil ploughing is impossible, and cultivation is by means of cutting down the grass with a *tajak*. The cut grass is allowed to rot *in situ* and when the plants commence to grow once more the *tajak* is again brought into operation.

Nurseries.—The preparation of the nursery precedes the cultivation of the fields. Dry-land nurseries are used, being sited near the house and protected from cattle. The site for the nursery is ploughed and harrowed twice after which the seed is broadcast thinly over the bed and a final harrowing given to cover the seed. Seedlings are ready for transplanting in the field when they are 40 days' old, but if cultivation of the fields is late through unsuitable weather, transplanting is necessarily postponed and the seedlings may remain in the nursery for periods up to three months.

The seedlings are taken from the nursery, the roots cleared of all soil and tied in bundles. The bundles are set in water for twelve hours before the tops of the leaves are cut and transplanting carried out.

Transplanting is done entirely by hand, without the use of such an implement as the transplanter, *kuku kambing*. The normal spacing in the fields is 12 inches, but varies considerably even within individual plots.

After transplanting, depth of water is liable to fluctuation with rainfall, but when a heavy fall of rain occurs, a large proportion of the cultivators take the opportunity of opening bunds and draining off all water in an attempt to catch fish in traps inserted in the openings.

About a month after transplanting the crop may receive an application of *baja bakar*, a mixture of cow-dung, earth, coconut and arecanut leaves which is burnt before application. About two tea spoonfuls of this manure is placed at the base of each plant and appears to have a slightly beneficial effect on the crop.

Harvesting.—Weeding is not practised, and after manuring the crop is left until ripe when harvesting is effected ear by ear with the small knife held in the palm of the hand (in Kelantan known as *Ketam-an*). The ears are tied in bundles (*gemar*) and stored in the ear. Threshing is done by working the ears between the feet, and winnowing by tossing the threshed grain in shallow baskets.

Dry Padi in Kelantan (*Padi Tugalan*).

The land planted with dry padi falls into two groups, that habitually under the dry crop and that which may be utilized for either the wet or dry type. The latter forms but a small proportion of the whole and comprises the lower lying dry padi or *tugalan* lands, the choice of wet or dry padi for any particular year usually depending on the inclination of the cultivator. Generally speaking, the fields are

flat or slightly sloping and in the latter case wet padi land is found at the bottom of the slope, dry padi land over the main area and the intermediate or alternating type mentioned above in a narrow strip between the two.

Throughout the dry padi areas lots are divided and demarcated by bunds.

The soil throughout the dry padi lands is markedly homogeneous and, though occasional ridges of slightly sandy soil are found, a heavy loam predominates.

In view of the localized nature of the crop it is not surprising to find that there are only some twelve distinct varieties cultivated. The maturation periods of these varieties vary from 173 to 197 days and, though the majority can only be used as dry padi, there are some which can also be successfully planted on wet land.

The success or otherwise of the dry padi crop is dependent on a favourable monsoon. Dry padi calls for an amount of labour and care which not all cultivators are prepared to give and which is greatly in excess of that required to produce a crop of the wet type.

There is a comparatively dry season, which may extend from the middle of February until the end of May, but which varies in duration and severity. This dry season is followed by showery weather in July and August, the showers becoming more frequent until they reach a climax in the monsoon. During the dry season the land bakes so hard that the local plough with a rounded sole and sharp turn on the mould board is barely able to penetrate the soil and the small local cattle, which have to exist on the sparse grazing provided by baked padi fields are unable to drag the implement effectively.

In preparation for the crop the peasant commences ploughing at the end of June or early July when the land has been softened by rain but has dried out sufficiently to avoid any danger of puddling. The land is turned over to a depth of approximately two inches and in dry weather is subsequently harrowed down. The soil is then allowed to lie for a period of about 10 days when it is said to be *masak*. Should rain fall after ploughing, the furrows break down and harrowing is unnecessary. These operations are repeated twice more with appropriate interval between cultivations, the objects being to attain a depth of cultivation of about $3\frac{1}{2}$ inches and to kill weed growth. Finally, the land is ploughed and harrowed a fourth time and seed planted in rough lines by dibbling in on the same day; subsequent cultivation is confined to weeding which is performed at varying intervals by cutting down the grass with a short knife.

Throughout these operations from the preliminary ploughing to the last weeding the utmost care is taken to avoid puddling the land or packing it unduly.

If the crop is to be a success it is essential that the plants should be well established and some 12 to 18 inches in height before the land becomes waterlogged. If planting is delayed the plants do not become sufficiently developed before water commences to stand in puddles on the surface; they do not tiller, weeding cannot be sufficiently performed, and the crop is poor. On the other hand, once the plants are well established and all weeds removed, the crop is unharmed by an excess of water.



Harvesting Padi by means of *Tuai*.

As an important point in the cultivation of this crop is to avoid puddling the soil, it follows that weeding should be completed before showers become of daily occurrence; thus it is advisable that the actual planting be completed early in August. This, however, may be a matter of difficulty. If the dry season has been severe and protracted the peasant is unable to commence ploughing until the land has been thoroughly softened by rain and subsequently, owing to the shallow furrow turned by the plough, he has to plough four times to obtain sufficient depth of cultivation. The four ploughings, together with the periods between ploughings, retard planting, until, by the time the crop is ready for weeding, rain is of daily occurrence and weeding ineffectual, being actually harmful by causing puddling.

The necessity for four ploughings to achieve sufficient depth of cultivation, and also with the object of eradicating weeds is open to doubt, but this has been the custom for a very long time and the cultivators continue to follow the methods practised by their progenitors.

Trengganu.

Four types of padi are cultivated in the State namely—

- | | | |
|---------------------------|---|--|
| (1) <i>Padi chedongan</i> | — | Wet transplanted padi. |
| (2) <i>Padi taboran</i> | — | Padi broadcast on dry land. |
| (3) <i>Padi tugalan</i> | — | Padi dibbled on dry land. |
| (4) <i>Padi huma</i> | — | Padi dibbled in on burnt off jungle land
which is subsequently allowed to grow up
in jungle. |

The cultivation of wet padi in large areas is confined to Besut and Kuala Trengganu Districts. A few small native-built irrigation dams have been constructed although, for the most part, the crop depends for water on rainfall, and the yield, therefore, fluctuates from year to year. In both of these localities the crop appears to be well cultivated and cared for. In other districts, cultivation of wet padi is confined to small and isolated blocks in which there is a marked lack of collective effort and only a slight understanding of pest control. In certain areas the most elementary principles of cultivation and water control are not understood.

Padi tugalan, on the lines of the Kelantan dry padi, is not extensively planted and though a few well-cultivated plots are seen, the principles underlying the cultivation of this crop are not generally understood so that the correct procedure is often a matter of luck and the crop more variable than should normally be the case.

Padi taboran is grown on land suited to *padi tugal* and is planted either because the owner knows no alternative form of cultivation, or because he has too much land to plant and care for by the superior *tugal* method. After three ploughings and harrowings, the seed is broadcast and harrowed in and thereafter the crop is left to itself. Weeding is impossible and the padi becomes wholly or partially choked with grass. Seeding is too close to allow plants to develop properly and a great waste of seed occurs. This is an exceedingly wasteful form of cultivation

from every point of view, but particularly in relation to land which is planted for two years and fallowed for one or two seasons the crop at its best can only be a partial success and can never be economic.

Padi huma is grown extensively throughout the State, but especially so in the Jajahan Timor and Ulu Trengganu. The jungle is felled and burnt off after which either one or two crops of padi are removed, the land then being allowed to grow up in secondary jungle and the cultivator moving to a fresh site.

Malacca.

Two main types of padi areas may be defined; firstly, the large continuous stretches of flat land in the coastal belt; and secondly, the long and comparatively narrow valleys inland. The former seldom had irrigation facilities, but these are gradually being improved by the Drainage and Irrigation Department. The greater part of the coastal padi lands rely entirely on the retention by permanent solid earth bunds of rainfall and surface run-off from adjoining higher land. The latter are usually irrigated individually by small natural streams, or by small canals from Government-built dams.

During the month preceding the commencement of cultivation, the drainage and irrigation channels are cleared and repaired, and any undergrowth within or bordering the area, which is liable to harbour pests, is cleaned communally.

Nurseries.—On the completion of clearing work, the nursery plots are ploughed. These are "wet" nurseries, usually situated on slightly higher areas of the fields so that they are not subject to deep flooding in the event of heavy rain. After lying fallow for about one month, the plot is lightly raked, then again ploughed.

The final preparation takes place immediately before sowing the seed, and consists of a thorough raking, or raking followed by a third ploughing, according to the texture and weediness of the land. The aim is to produce a clean seed bed uniformly level and puddled to a depth of about 4 inches. Final levelling is done by dragging by hand a float over the surface. The plot is left for one or two days for the mud to settle, and all surface water is run off.

Subsequent operations of sowing the nursery follow those described under Province Wellesley and Penang, except that the germinated padi seed is sown in strips about 10 inches wide.

Cultivation.—The method of cultivation of the padi fields follows the general lines of that for the nurseries, but is less thorough. Two ploughings only are given, and the final raking carried on until no clods show above the surface of the water, which is usually about two or three inches deep, and the soil is sufficiently softened for easy transplanting. Between the first and second ploughing, the bunds which separate fields are trimmed and repaired where necessary.

The seedlings are transplanted after about 44 days, the roots cleared and steeped in a manurial paste prepared from a mixture of ashes, burnt and powdered bones and sea mud, or the bone ash is replaced by bat guano from Kedah or Perlis. The bundles of seedlings are stacked after treatment and kept for three days when bone ash is used and one day when guano is employed.

Transplanting is by hand, from 3 to 10 seedlings per "hill" spaced about 10 inches apart.

After transplanting nothing further requires to be done except weeding. Where the cultivation has been thorough and from 4 to 6 inches of water can be kept on the fields, weed growth is negligible. In most cases, a rough weeding, about two or three months after transplanting, suffices.

When possible, the water is drained off before harvest, and harvesting carried out before the crop is dead ripe to avoid loss of grain. The crop is harvested with the sickle, threshed in the field, winnowed and stored.

The stubble is burnt off at the first favourable opportunity after harvesting is completed.

Selangor.

The area under padi cultivation in Selangor can be divided into two divisions, namely the inland and coastal districts.

Dates of planting vary, for rainfall in the inland districts is greater than near the coast. Planting in the former commences in May and June and in the latter in October.

Cultivation.—The land covered by about 3 inches of water is cultivated with the *tajak*, or dug with a *chankol*. The grass is drawn into small heaps (*gulong*) and after 40 days drawn to the bunds. Grass which subsequently grows is removed by hand and forced into the soil. The soil is puddled and levelled by treading or with the *tajak*.

Weeding commences when the seedlings have been transplanted for about one month.

Nurseries.—Nurseries are prepared on dry land, fenced and the newly-planted seed protected from birds by covering it with cut *lalang* grass.

Transplanting.—Transplanting commences when the seedlings are 45 days' old. Some cultivators remove the seedlings the day before transplanting, others take them straight from the nursery to the field. The top of the leaves of seedlings are cut off before transplanting. Transplanting is performed by hand.

Harvesting.—Harvesting is usually performed ear by ear with the small knife (known in Selangor as *tuai*). Threshing is done by treading, and for winnowing, the padi is placed in a tray made of bamboo (*niru*) and shaken backwards and forwards to separate the empty grains, and winnowed in the breeze.

Storage of Padi.—Various methods of storage of padi are practised in Malaya, but in many areas, bins made from the bark of the jungle tree and called *kepok* are popular.

Negri Sembilan.

The padi-producing areas of Negri Sembilan are confined to inland valleys, formed principally by the main range which traverses the State. These valleys, in many cases, are of no considerable breadth and are therefore liable to short periods of inundation during spells of heavy rainfall.

Water Supply.—Irrigation was effected almost entirely by the native brushwood dam, distribution of water being by a ditch line. Permanent dams have now been erected by the Government in many places to replace the brushwood dams which were easily destroyed by floods and caused considerable damage to the banks of the rivers.

In some areas water wheels, made mostly of bamboo and rotan, are used for lifting water from rivers to the higher level of adjacent fields.

Cultivation.—Preparation of sawahs commences in April-May when the weeds are cut with the *tajak*. The vegetation so cut is allowed to remain on the land for a period up to 5 weeks, during which time it is an advantage to have a plentiful supply of water to hasten the decomposition of the mass and retard fresh growth. Subsequent cultivation is determined by the nature of the soil and quantity of water available. Deep soil which has been under cultivation for some years can, providing an ample supply of water is available, be worked over by a roller, (*pengilling*) which consists of a cylindrical piece of hard wood some 4 feet long and 7 inches in diameter, into which is secured four transverse rows of rectangular pieces of wood about 4 inches long and 2 to 3 inches wide, giving the whole the appearance of a paddle wheel. This implement is very efficient, incorporating the vegetation into the soil, and producing a well-puddled condition suitable for the reception of the seedlings.

The desired result may also be obtained by agitating the soil to a sufficient depth by means of the heavy hoe (*chankol*) or the *tajak*, and treading in by foot, either manual or animal (*melunyah*). This operation is occasionally assisted by the use of a light rake-like implement (*sikat*), drawn by a buffalo. Shallow soil or land inadequately watered is similarly treated, the work in this case requiring the exercise of much more energy before the desired effect is obtained.

Immediately before planting out, any vegetation which has not been turned into the soil is either removed to the bunds, or worked into the soil by foot.

The use of ploughs for the initial breaking of the land is very unusual.

Nurseries.—The nurseries are laid down in May and June. Dry land nurseries in a shady sheltered situation are probably the most popular, although wet nurseries are not uncommon. The seed is soaked before planting, the nursery protected from birds by leaves and from buffaloes by fencing. Transplantation is usually between 40 and 45 days after sowing.

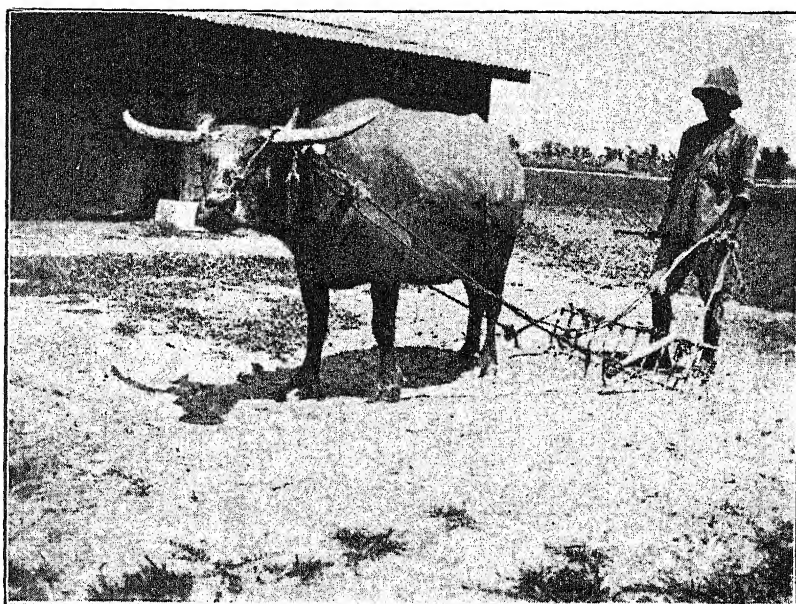
Transplanting.—Immediately before transplanting, surplus water is drawn from the prepared fields and is maintained in this condition for about a week after planting, by which time the plants are fairly established, when water supply is increased.

The seedlings are drawn from the nursery, the roots washed, leaves cut back, and the seedlings kept for a day before planting. Planting in the field is performed by hand, generally by women, from 3 to 5 seedlings per "hill," "hills" being spaced for 15 to 20 inches apart depending on the fertility of the soil.

Weeding follows a month or so later, but efficient weeding is often neglected.



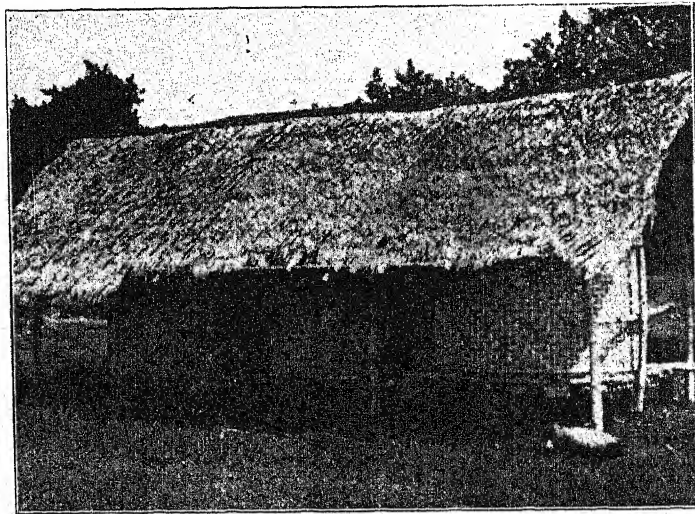
Roller.



Rake-Harrow (*Sikat*).



Harvesting and Threshing, Malacca.



Padi Storage Bins made of Plaited Split Bamboo

Harvesting.—Usually the crop is harvested with the small hand knife (*tuai*) though in recent years the *sabit* or sickle has been introduced in a few localities. The ears are cut with the right hand and passed to the left when they are collected into a small bundle. These bundles (*gemalan*) are dried. Threshing is done by trampling with bare feet on a raised platform composed of bamboo slats. The grain falls through the interstices and is collected on a mat below.

Where the sickle is used, threshing is performed by beating the grain into a tub.

Winnowing is performed by hand, a tapering tray (*niru*) being employed. By shaking backwards and forwards a large proportion of the chaff is separated, worked to the edge of the tray and discarded. The grain is then allowed to fall onto a mat at a time when a good breeze is blowing. An alternative method, known as *tampi*, by which the separation of the grain from the chaff is made with a bamboo or rotan sieve is also used, but is considered laborious.

Storage.—The usual form of store is the *kepok*. This is a cylindrical bin or tun which, in Negri Sembilan, is made from the bark of a jungle tree called *kepong* (apparently a species of *Shorea*). Two such bins, one large and one small, are commonly housed in a single raised shed (*rumah kepok*) the roof of which is made of *atap* and the walls of split bamboo. The smaller bin is used for storing glutinous rice (*pulut*) and the larger bin for the ordinary hard rice. They are made in all sizes, frequently being about 4 feet in height and 12 feet in diameter; such a bin would have a capacity of about 500 gallons. A disadvantage of the larger bins is that when the level of the padi is getting low, the extraction of further supplies for household use is troublesome.

The type of store known in the Northern States as *jelapang* is becoming popular in some localities, particularly among Sumatra Malays, being known as *rumah padi*. It is a self-contained rectangular store surmounted by an *atap* span roof. The walls are of wood or other local material. The top is closed and the grain is extracted by a sectional door, the segments of which can be made to slide out singly as the level of the grain gets lower. This door is locked at night.

Pahang.

Of the Federated Malay States, the practices followed in padi cultivation in Pahang are the most primitive of any of the four States.

Soils.—In the western portion of Pahang the soils utilized for wet padi cultivation are usually heavy clay, but in the eastern districts, more especially near the coast, soils are of a very light nature and invariably contain a very much larger percentage of both fine and coarse sand. In some parts of the coastal areas low-lying peaty soils are cultivated but only in the case when the peat is comparatively shallow. The principal drawback to the sandy soils of Pahang lies not so much in poor fertility as in lack of water-holding capacity, a serious objection under local conditions, because controlled water schemes are few.

Climate.—Rainfall varies from District to District in so far as total precipitation is concerned, but the wet months in the western Districts coincide with those of the

east, with the exception of the month of February which in inland Districts is usually exceptionally dry.

Planting Seasons.—Three separate planting seasons are recognized in Pahang, namely:—riverine areas, March/December; western Districts, July/February, coastal areas, June/March.

Owing to the frequent floods in December and January, the sowing of nurseries for “wet” padi usually takes place towards the end of February or early March, which allows of the crop being harvested by the middle of December before any real danger of losses occurring through floods.

Preparations for planting in the western Districts are slightly later as the flood question is less serious and also the damage from drought during the drier months is not so severe, as in most instances the water supply is supplemented by small irrigation schemes. Harvesting takes place towards the end of December and early January.

In the coastal areas the season is much later as, due to the very flat nature of this region, there is little or no danger of damage resulting from floods, whilst the dry months of June and July can be avoided. Nurseries are usually sown towards the end of June and the seedlings ready for transplanting at the commencement of the rains, which supply the whole of water requirements. Harvest commences towards the end of March or early April when conditions are favourable.

Nurseries.—Nurseries to supply seedlings for any types of “wet” cultivation are usually situated on dry land, although the recent introduction of several types of wet nursery has been noted in some areas. Secondary jungle land is usually selected, felled and burnt shortly before sowing the seed. A few larger trees are usually left to afford light shade. The seed, previously soaked in water, is broadcast after the soil has been lightly cultivated, the area then raked to bury the seed. A small amount of weeding is done later if necessary and in the event of dry weather the beds may be watered. Such nurseries are known as *semai darat*. The seed rate is about 4 to 5 gallons for every acre to be planted.

The seedlings remain in the nursery for 6 to 7 weeks, or much longer if weather is unsuitable for transplanting.

Cultivation.—Broadly speaking, there are only two types of land used for “wet” padi cultivation, referred to as *paya* (swamp) and *paya sawah* (irrigable). In *paya* cultivation the land usually comprises low-lying and swampy areas, bordered by low hills and with or without a stream passing through the land. A *paya* which relies entirely on local rainfall is referred to as *paya takong*, but should a small stream exist, capable of supplying a portion of the water supply, it is then referred to as *paya anak sungei*.

Paya sawah more closely approaches the type of cultivation met with in the western States, and comprises flat land, not necessarily of a swampy nature. In a few instances, slightly undulating land is cultivated by terracing. In almost all cases *paya sawah* is equipped with some form of water supply, although it may be insufficient for the whole area cultivated and reliance has to be placed on a portion of the water requirements being supplied by local rainfall.

The cultural methods practised and the yields obtained from *paya sawah* are superior to the *paya* cultivation.

The larger areas of "wet" cultivation comprise *paya*, mostly alienated in the riverine area, whilst *paya sawah* is confined almost entirely to the western portion of the State.

The methods of cultivation followed in the *paya sawah* are very similar to those found in Negri Sembilan. The methods used in the *paya* and in the coastal areas are various, and are somewhat similar to those in Trengganu.

There are no fewer than four system of cultivation known in the coastal areas, namely: *paya chedong*, *paya tabor*, *paya simbah*, all of which may be classed as "wet" cultivation, and *padi tunggal* or *ladang* under "dry" cultivation.

Chedong literally means to transplant; hence any padi land on which transplanting is practised is called *paya chedong*. Of the three wet methods in vogue the *chedong* method is undoubtedly the best. It is commonly practised on localized areas chiefly on the coast where most of the planters have land held under Temporary Occupation Licence. *Tugal* is the common system practised in new clearings on hilly lands. There is very little area under this form of cultivation at present.

Paya Chedong.—The main operation in the preparation of this type of padi land is to cut down all the standing grass with a *parang* or cutlass (*merembas*) and allow it to rot *in situ* for about 3 to 4 weeks. Prior to the big flood in 1927 when there were plenty of buffaloes, the *paya* was ploughed but at present such a practice is never done. In places where the soil is hard a *chankol* or *tajak* is occasionally used and, in some cases, the buffaloes are employed to trample the grass on the *paya* and puddle the soil. This is the only form of tillage of the soil before planting.

The construction of bunds is only casually done in a few *paya*. Small dams and such other minor works are usually erected with the financial assistance of Government, the owners being made to carry out the necessary work.

Paya Tabor.—The preparation of the land is practically the same as detailed above but probably with less attention to details. The area is not planted with seedlings raised in a nursery but is merely broadcast with seeds which have been immersed in water for about 2 nights. The area under this form of cultivation is fairly small, its place being superseded by *paya simbah*—a most haphazard sort of cultivation requiring the least minimum efforts.

Paya Simbah.—The jungle or secondary jungle growth is first felled, cleared and burnt during the dry season. Frequently the burning is unsatisfactorily done. At the commencement of the rainy season the wet seed is broadcast on to the semi-wet *paya* and then left entirely to the mercy of the weather till harvest time. Cultivation, beyond perhaps an occasional weeding, is never done. Usually 5 to 7 gallons of seed are required to plant up an acre.

This wasteful method of padi planting owes its origin to the Sakai, a great number of whom are found in the upper reaches of the main rivers on the coast. After 2 or 3 successive plantings the land is abandoned and new areas are acquired for the same purpose.

Tugal or Ladang.—This form of dry padi cultivation is commonly practised throughout the Malay Peninsula on new land under virgin jungle. After felling and burning the jungle during the dry season the seed is dibbled into the ground, 6 to 12 seeds per hole.

Seeding rate per acre is about 4 to 5 gantangs. After 2 or 3 croppings are obtained the land is then planted with permanent crops, usually fruits or coconuts.

Harvesting.—In harvesting the ordinary *pisau tuai* is used. In several *paya* harvesting is done in co-operation, but when there is a fairly good crop outside labour (usually Malays from the neighbouring villages who have either lost their own crops or failed to plant) is employed on the 1/5 or 1/3 system depending on the condition of the crop to be harvested.

The crop thus harvested in ear form is then threshed and winnowed by means of a *nyiru* either directly in the field or after it is collected and brought to the house. The cleaned padi is well dried in the sun before storage. The common receptacles used are gunny bags, but if the crop is fairly large bins (*kepok*) made of wood or strong bark are specially prepared for storing purposes. The grain is taken out whenever required for home consumption. Any surplus (which is unfortunately very rare) is immediately sold to the Chinese shops in towns and, in the neighbourhood of Temerloh, to the Government Rice Mill erected in 1935.

After harvesting the straw is merely left standing on the field to rot. The stubble is never burnt except in a very special case. In many places buffaloes and other animals are allowed to roam about and graze on the *paya*.

Johore.

Rice production has not yet attained significant proportions in Johore. Investigations of extensive potential areas are now being undertaken with a view to assessing the dependence of the State upon importations.

Production is largely dependent upon the market conditions for other important economic staples such as rubber and copra. During periods of depression the cultivated area has reached an aggregate of 17,000 acres, largely as the result of opening and planting small swamp areas, often unsuitable for the purpose and from which negligible crops are obtained. Under normal conditions production is confined to some 6,000 acres of old established *sawah*.

The principal producing areas are situated in inland valleys in the northern districts of the State, of which Segamat is the centre. Soil conditions are eminently suited to padi cultivation but the absence of facilities for adequate water control and the complex weather conditions prevailing in these localities mitigate against economic production except during favourable seasons.

In the areas situated in the Segamat District a March/November season is observed owing to the possibilities of flood damage near the end of the year. This practice however often exposes the newly planted crop to severe drought conditions except in the few areas where irrigation is possible. Methods of cultivation and harvesting closely follow those employed in Negri Sembilan and Malacca, the use

of buffalo-drawn implements having become increasingly popular during recent years. In these areas a padi planting tradition has become established, and the various operations associated with cultivation are well performed.

In the well established but limited areas near Tangkak where irrigation facilities exist the normal July/February season of the west coast is followed, methods of cultivation and management being almost identical with those of Negri Sembilan. Upkeep, however, is often neglected, and losses from pests consequently large.

In other localities, principally along the east and west coast, small isolated areas are cultivated during a March/November season. In these water control facilities are either non-existent or inadequate, cultivation and maintenance receive insufficient attention and pest damage is normally severe.

Dry padi (*padi huma*), which at one time was extensively cultivated, is now concentrated in a limited area of small importance in the Muar District.

Brunei.

The usual method of cultivation is a primitive one whereby buffaloes are driven on to the land after the off-season growth has been cut down, dry nurseries are sown, and the plants are transplanted when about 40 days old. The maintenance of a covering of water over the surface of the land after planting, the necessity for strict adherence to planting dates so as to minimize pest damage, the elimination of water after flowering, and the selection of the most suitable types of soil, all of which are usually understood and widely practised in the Malay Peninsula, are comparatively unknown in Brunei.

It is perhaps worthy of note that in Brunei all wet padi land is known as *paya* land, *i.e.* swamp land. The word *sawah*, commonly used in the Peninsula for wet padi areas, is practically unknown in Brunei. The use of the word *paya* is interesting inasmuch as it affords comparison with parts of Pahang, where this word is used to describe deep swampy land situated in the low-lying parts of valleys and where, presumably, soil conditions are similar to those obtaining in Brunei. It is also note-worthy that buffaloes are used in the preparation of the land for padi planting in Brunei, as in Pahang.

Labuan.

The methods of cultivation are substantially the same as those commonly employed in Brunei, *i.e.* the soil, when covered with a thin layer of water, is trampled by buffaloes and all weeds are trodden in. Dry nurseries are usually sown and the plants are transplanted when about 44 days old. Little subsequent attention is paid to the crop until harvest time. In Labuan weeding is seldom practised, this being a departure from the Brunei custom. The soil is mostly of a heavy clay nature, capable of producing excellent crops with a controlled water supply, and the use of implements such as the buffalo plough is possible.

Aquatic weeds are common in some areas, causing a reduction in the vigour and yield of the crop. As weeding is seldom practised, little or no attempt to control the growth of these weeds is made by padi growers.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

4th Quarter, 1938.

*Prepared by the Economics Branch of the Department of Agriculture,
S.S. and F.M.S., in collaboration with the Field Branch of the
Department.*

Rainfall.

With the exception of Malacca which experienced heavy rain, the weather throughout the country in October was unusually dry and hot, until the last week of the month when rainy weather set in on the east side of the main range and in north Johore. November was a dry month except on the east, where heavy rains continued until the fourth week. Malacca again experienced heavy rains throughout December, but elsewhere dry and hot weather persisted until Christmas when, and until the end of the year, rainfall was heavy, except in Johore where dry weather was experienced throughout the month.

Prices.

As shown in Tables I and II, the price of rubber remained fairly steady throughout the quarter, at around the level reached at the end of the third quarter.

A rise in coupon value took place in October, on the announcement of the quota rate. In most parts of the country coupon values reached a higher level than at any time during the preceding quarter. The average price of coupons was about \$28 per picul, although in some districts it was as high as \$30 per picul. Rubber not covered by coupons was correspondingly low, from \$5 to \$6 per picul being usual. It is generally considered uneconomic to tap if the price of the uncoupons product falls below \$6 per picul; this price-factor at least partially accounts for the further increase of areas which were out of tapping.

Production.

The total Malayan production of rubber in 1938 amounted to 360,898 tons, of which 114,678 tons (32 per cent.) were produced on small holdings. Of the total area planted with rubber 1,275,822 acres (99 per cent.) is in areas of less than 100 acres. These figures reflect the very high out-of-tapping figures for small holdings, a proportion of the coupons being sold and used to cover the produce of the larger estates. Quarterly production on small holdings is shown in Table III.

Quality of Rubber.

The greater part of the rubber produced on small holdings is sold as un-smoked sheet. Despite the fact that a cheap smoke house has been devised and that considerable propaganda has been directed to make it known throughout the country, there is a general disinclination to produce good quality rubber. Here

Table I.
Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul of 133 1/3 lbs.)

4th Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			OCTOBER					
Smoked sheet	37.00-32.00	37.50-26.00	37.00-34.00	37.00-31.00	36.50-31.50	37.50-32.00	37.80-26.00	37.00-31.50
Unsmoked sheet	36.00-31.00	35.10-29.00	36.00-30.00	35.50-29.00	35.10-30.50	35.50-30.00	34.00-25.50	35.50-30.00
Scrap	32.50-24.00	28.00-26.00	30.00-28.00	—	—	30.00-25.00	30.50-27.00	32.25-27.00
			NOVEMBER					
Smoked sheet	37.00-33.00	36.80-31.50	37.00-32.00	36.50-32.00	35.20-31.00	35.50-34.50	36.50-32.50	36.50-31.00
Unsmoked sheet	36.00-32.00	35.40-29.00	36.10-30.00	36.00-31.50	35.30-30.50	34.00-32.50	34.50-28.50	36.00-29.50
Scrap	32.00-23.00	27.00-25.00	30.00-26.00	—	—	30.00-26.50	30.00-24.00	30.50-27.00
			DECEMBER					
Smoked sheet	37.00-33.00	37.00-30.50	36.00-32.00	35.60-32.00	35.60-32.00	36.50-34.50	35.50-32.00	35.50-31.00
Unsmoked sheet	36.00-31.00	34.50-29.00	35.75-30.00	34.60-31.00	32.30-30.00	35.00-32.50	33.00-29.50	34.50-30.00
Scrap	29.00-23.50	26.00-24.00	28.50-27.00	—	—	29.50-28.00	29.00-26.00	29.50-26.00

Table III.
Production of Rubber on Small Holdings.
 (in tons)

	Total 1937	1st Quarter 1938	2nd Quarter 1938	3rd Quarter 1938	4th Quarter 1938	Total 1938
Federated Malay State ...	91,134	17,967	15,683	10,591	10,089	54,330
Unfederated Malay States ...	80,605	16,749	14,039	10,639	9,015	50,442
Straits Settlements ...	17,097	3,298	2,759	1,894	1,955	9,906
TOTAL MALAYA ...	188,836	38,014	32,481	23,124	21,059	114,678

and there an enterprising owner of rubber land erects a smoke house, but reports from almost all parts of the country are to the effect that smoke-houses are standing idle.

The main reason for this discouraging state of affairs is that the dealers to whom the produce is usually sold are generally in a small way of business and consequently carry out no grading before selling to large dealers. The margin between smoked and unsmoked sheet is therefore narrow, usually between \$1 and \$2 per picul. The basis of purchase is to make a cut of 8 to 10 per cent. for unsmoked sheet and to add a charge of 50 cents per picul for estimated cost of smoking.

Efforts are now being made in one or two districts to induce groups of small holders to bulk their produce for sale to dealers in a large way of business who are prepared to grade the consignment and pay cash down on the graded product. Experimental sales of this description have been encouraging and it may be possible by the establishment of such a system for the small producer to be more independent of the village dealer and thus obtain a better price for his product.

In many districts scrap rubber has been unsaleable.

The practice of selling rubber latex to dealers in place of prepared sheets has gained in popularity in two areas in Johore. The latex is reported to have been sold at 18 cents per 10 kati (13 1/3 lbs.). In parts of Johore, also, it is reported that the practice of selling rubber to unlicensed Chinese village shopkeepers continues, but in certain areas where this was usual, small-holders are now disposing their stock to licensed dealers from whom better prices are obtained.

General Condition of Holdings.

Reports from most States mention improvements in the general upkeep of holdings, and for this improvement the propaganda work of the Asiatic Rubber Instructors is partly responsible. Improvement work is frequently more in evid-

Table IV.
Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of December, 1938.

PERAK					SELANGOR					NEGRI SEMBILAN					PAHANG				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage	
Batang Padang	36,187	8,700	24		Klang	16,143	7,300	45		Seremban	23,639	19,900	84		Raub	10,534	6,600	63	
Kinta	38,874	5,400	14		Kuala Langat	23,881	7,200	30		Tampin	21,866	17,300	79		Kuala Lipis	15,457	2,200	14	
Kuala Kangsar	92,166	9,900	65		Ulu Langat	45,012	14,000	31		Kuala Pilah	31,832	16,900	53		Bentong	12,224	2,400	20	
Upper Perak	15,590	7,900	51		Ulu Selangor	31,463	12,300	39		Jekebu	9,097	2,500	28		Other Districts†	40,373	13,500	29	
Larut & Selam	43,132	10,100	23		Kuala Lumpur†	20,277	7,100	35		Port Dickson	11,133	9,200	83						
Krian	9,408	7,200	77		Kuala Selangor†	8,417	2,900	35											
Lower Perak*	26,735	17,400	65																
Dindings	9,873	7,000	78																
	271,905	123,600	45			145,193	50,800	35			97,597	65,800	67			84,588	24,700	29	
MALACCA					PENANG & P. WELLESLEY					SINGAPORE					JOHORE KEDAH				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		PERLIS	350,007	75,500	21	
Central	14,003	9,700	69		North	3,549	1,300	38		Singapore	20,115	800	4		KELANTAN & 1	101,126	42,900	42	
Alor Gajah	30,838	15,700	51		Central	10,785	4,800	45							TRENGGANU	2,916	29,500	36	
Jasin	25,286	6,100	24		South	8,936	7,100	80											
					Penang	15,822	600	4											
	70,217	31,500	45			39,092	13,800	35			20,115	800	4						

The percentage of areas out of tapping in September, 1938, was as follows:—Perak 40, Selangor 43, Negri Sembilan 63, Pahang 39, Malacca 41, Penang and Province Wellesley 34, Singapore 4, Johore 23, Kedah 27.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

‡ Estimated from percentage for rest of Malaya.

ence towards the end of a quarter, the object being to obtain an increased coupon allowance. There is little further improvement in tapping, but the high proportion of trees which are rested ensures satisfactory bark renewal. Sanitation on many holdings leaves much to be desired.

Danger of soil erosion calls for little comment, as the soil on most holdings is protected by a cover of undergrowth. On some clean-weeded Chinese holdings, however, damage by erosion is evident, and on the hilly lands in part of Pahang there is loss of soil. New alienations in Pahang carry special conditions providing for proper measures to prevent erosion.

"Wintering" was well advanced in Penang at the end of the quarter, and had commenced in Province Wellesley.

Tapping.

There was a slight increase over the previous quarter in the area of tappable rubber untapped. At the end of the quarter it was estimated that 36.4 per cent. of small holdings was out of tapping as compared with 36.0 per cent. at the end of the previous quarter.

Tables IV and V tabulate the results of the quarterly survey and provide a comparison with the previous quarter and last year.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	December, 1937		September, 1938		December, 1938	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S. ...	114,400	19.1	274,800	45.9	264,900	44.2
S.S. ...	13,100	10.1	42,800	33.0	46,100	35.6
U.M.S. ...	74,300	13.9	137,600	25.7	147,900	27.7
Malaya ...	201,800	16.0	455,200	36.0	458,900	36.4

Planting.

Interest has quickened in taking advantage of the opportunity for planting additional areas of rubber. In consequence, share certificates which in the third quarter dropped in value to about 80 cents have in many parts of the country increased in value up to \$1.50. Each share certificate gives the right to plant 1/20 acre of rubber trees.

In many cases small holders who contemplate planting are anxious to secure high quality budding material. At a number of Agricultural Stations, therefore, nurseries are being laid down for multiplying suitable clones of budwood for sale at cost price. It is anticipated that budwood from these Stations will be available in 1940.

Replanting of old areas is seen, generally on the medium-size holdings owned by Chinese and Chettians who have made arrangements to plant budded rubber. The total area thus replanted is unknown, but cannot be large.

Pests and Diseases.

The only disease which calls for special comment is Mouldy Rot (*Ceratostomella fimbriata*) which was more evident in districts where rainfall was plentiful. The average small-holder is beginning to realize the importance of prompt and correct treatment, as is evidenced in the increased sales of approved fungicides by the Department and by shopkeepers. In Negri Sembilan and Malacca, however, small-holders are prone to use tar for the treatment of this disease.

Root diseases are reported from various parts of the country but nowhere was any serious outbreak reported.

Cockchafer were reported as causing damage in Negri Sembilan and in Lower Perak.

Economic Position of Small Holders.

The economic position of small holders has shown no improvement during the quarter and in certain areas has further deteriorated. The decrease in the area tapped has resulted in an increase of unemployment amongst tappers. The continued low price of rubber, coupled with the restriction of output has proved a strain on the poorer small-holders, who now seek other employment to augment their incomes.

QUIT RENTS ON COCONUT AND OIL PALM LANDS.

The Federated Malay States Government has decided that the concessions in the matter of the payment of rent on coconut and oil palm lands which have been in force during 1937 and 1938 shall be extended till the end of 1939. The Government, however, reserves to itself the right to refuse any further extension of the concession beyond the end of 1939.

The concessions under reference are as follows:—

- (i) COCONUT LANDS. In the case of lands exceeding 10 acres in area—
 - (a) the rent on planted areas already enjoying the rebate for land cultivated with coconuts under the Land Rules and paying \$2 an acre will be reduced to \$1 per acre;
 - (b) unplanted area will also pay \$1 per acre only.In case of lands not exceeding 10 acres in area, the effect of the concession will be to reduce the rent, which is in the majority of cases less than \$2 per acre, by half.
- (ii) OIL PALM LANDS. A rebate will be given of 50 per cent. of the rent rent payable with a minimum of \$1 per acre on planted and unplanted areas.

Applications for either of these concessions should be made to the Collector of Land Revenue of the District in which the land is situated. The question of eligibility of applicants for the concession is a matter for the discretion of the State authorities.

CONTROL BOARD OF PINEAPPLE PACKERS.

The inaugural General Meeting of the Central Board of Pineapple Packers was held in Singapore on 6th February, 1939, and was attended by all packers or their representatives, representatives of the Pineapple Growers' Association, Singapore Chamber of Commerce and of the three Governments concerned, *viz.* the Straits Settlements, Selangor and Johore.

The primary object of the Association is to improve conditions in this important industry by fixing selling prices of the finished product and by fixing also the quantity of pines to be canned in any one season, thus eliminating the cut-throat competition which in the past has been a major factor in depressing the price. One of the features of the scheme is the enforcement of a stated price for pines at factory, which is dependent upon the selling price of the canned product.

Under the rules of the Board, no decision on matters affecting growers or exporters can be taken until representatives of these two branches of the industry have had an opportunity of expressing their opinions on the proposal, and all discussions are subject to the consent of the senior of the Government officers present. There are, at present, two Government officers on the Board, *viz.* the Adviser on Agriculture, nominated by the Colony and Selangor, and the Senior Agricultural Officer, Johore, nominated by Johore.

Departmental. FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

January, 1939.

The Weather.

In the north-western areas of the Peninsula, including Krian, dry weather conditions, normal for this season of the year, were experienced. Over the remainder of Perak, Selangor and Negri Sembilan ample rainfall was recorded, particularly in North Perak, where heavy rainfall in the hills caused a certain amount of flooding.

Conditions in Kelantan, where exceptionally heavy rains occurred, were abnormal. The highest rainfall for the month was recorded at Pasir Puteh (58.14 inches) and the lowest at Tumpat (30.62 inches). In this State the average rainfall for January ranges between 9.59 and 13.9 inches. Most of the rain fell during the first half of the month and serious floods occurred in a number of localities, Pasir Puteh being the worst affected.

In Pahang rainfall was well above average and the Pahang River rose considerably above its normal level, but flooding has not yet been reported.

Conditions varied throughout Johore. In the east coast areas rainfall was above average; in the south and west precipitation was normal, while in the northern areas conditions were hot and dry.

Crop Reports.

Rubber.—During the first half of the month prices showed a tendency to advance but weakened subsequently and closed at the former level.

With the advent of dry weather conditions wintering has commenced in parts of the north-western areas. It has been reported that as a result of the widespread sale of coupons in the Kuala Muda District of Kedah, over 300 tappers have been thrown out of employment.

Small holding producers in Perak are evincing a keen interest in new planting and replanting. A group from the Sitiawan District approached the Department with a view to purchasing a minimum of 20,000 budded stumps. In view of the difficulty of preparing budded material in very large quantities, action has been taken to demonstrate the technique of budding and to arrange for the distribution of suitable clonal material from Departmental nurseries already established for use on seedlings which the small-holders have decided to raise themselves. It is understood that applications to plant and replant a considerable aggregate area have been received at Land Offices, and it appears probable that a large proportion of this area will be budded. In some areas small-holders are reported to have purchased clonal seed.

A considerable number of applications for conversion of title to permit the planting of rubber have been made, particularly in respect of areas in Pahang at present cultivated under dry padi.

In all parts of the country the value of share certificates has increased considerably. In Pahang prices have reached \$60 per acre, in Selangor \$55 to \$60 and Johore \$46 to \$57.

The abandonment of the use of the improved type of small smoke cabinets which has been progressively reported from other western States has now spread to South Pahang owing to the small premium paid by dealers for good quality smoked sheet.

Padi.—In Kedah and Kelantan harvesting has now commenced, and crop prospects appear to be good except in late planted areas. A commencement has been made also in some areas in Penang and Province Wellesley where the crop promises to exceed earlier expectations. In Negri Sembilan the harvesting of an average crop is now well advanced.

In the Panchang Bedena area of Selangor the appearance of the crop is now promising and water supplies are ample. During the month transplanting was undertaken on some of the higher areas which were previously dry, but sufficient seedlings to complete the planting were not available owing to the advanced age of the nursery material. It is estimated that the planted area for the current season is approximately 9,800 acres.

About one quarter of the 12th mile Tanjong Karang area is now carrying a crop and has sufficient water supplies. Further planting is not possible as nurseries, established earlier in the season in anticipation of a sufficient water supply, have died out.

In the Kuala Lumpur District preparations are being made for sowing nurseries in February. There is now a complete overlap of seasons in different parts of the State.

Many small power-driven rice mills continue to be erected in the main producing areas throughout the country. A recently completed list of such mills in Kedah shows a total of 37 as compared with 16 at the end of the previous year. Machines with a capacity in excess of 50 bags per day had previously been popular but recently mills with a small output have been gaining favour.

One new rice mill has been erected in Perak and one in Province Wellesley. A Malay Rice Millers' Association has also been formed, the principal objects being to prevent unnecessary competition and to exchange information on the marketing of milled products. Small mills in Perak have been idle during the month owing to the shortage of rice.

Fish.—During the draining of the padi fields in Perak, cultivators have been busy trapping fish. The season's catch is expected to be similar to that of the previous year, when, in spite of reports of small catches, exports of dried fish reached a total of 7,289 piculs, which was about double the average for the previous five years. Rice cultivators in these areas derive a large part of their income from the sale of this commodity.

Pineapples.—The production of pineapples for canning in Selangor fell off rapidly during the month. In Johore the fruit season ended early in the month and most factories ceased operating.

Fruit.—From Perak it is reported that considerable interest is still being maintained by cultivators in budded fruit trees. It is hoped that soon stocks will be sufficient to meet the greater part of this demand, but it will be some time before sufficient material will be available to supply individuals who require to plant 3 or 4 acres. Therefore, such applicants are being advised to plant their own nurseries for budding.

Exports of bananas from Negri Sembilan during January totalled 14,045 piculs; 13,005 piculs came from Jelebu and 1,040 piculs from Seremban.

In Singapore sugar cane is being grown as a special crop in several districts, in preparation for the Chinese New Year celebrations. The usual variety grown is the large yellow cane known as "Bourbon." Large quantities of cane for eating are imported annually from Hongkong and China at this time of the year.

Vegetables.—The Agricultural Officer, Singapore, reports that owing to the large demand for vegetables by the increasing Services and civilian staffs in the Changi and Seletar neighbourhoods, supplies from these areas, and even further afield, are insufficient; consequently less and less locally produced vegetables are available for Singapore markets, thus necessitating increased imports from the Netherlands Indies and Johore.

Considerable reorganization at this Station has recently been carried out. The new fruit area will contain only proved good quality trees, and a representative collection of budded and marcotted plants obtained from such trees in different parts of the country has already been received.

Ducks.

A flock of ducks for observation and trial has recently been obtained for Tanjong Piandang Padi Test Station in Perak. The birds are stated to be in good condition and are now starting to lay regularly and to use the trap nests. Most of the eggs are laid between 7 and 8 a.m.

DEPARTMENTAL NOTES.

Instruction to School boys in Kedah.

The first part of the annual course of instruction to Standard VI school boys was held at the Telok Chengai Padi Experiment Station from 20th to 26th January, 1939; 18 boys attended and lived at the Station during this period. The syllabus covered an outline of padi cultivation, varieties and their characters, cost of operation, harvesting, threshing, winnowing and milling.

Visitors to the Agricultural Station, Singapore.

The visitors' book at this Station is interesting in that it reveals that Asiatic visitors generally, and the Chinese in particular, are attracted because of their interest in fruit cultivation, whilst Europeans go out of general interest, but generally buy fruit trees before leaving.

Rural Lecture Caravan.

The Rural Lecture Caravan carried out a programme in the Tampin and Seremban Districts of Negri Sembilan from 10th to 29th January, 1939. Attendance at night shows was satisfactory, but afternoon lectures were poorly supported. Wet weather tended to reduce audiences at some centres.

Farm School, Ayer Itam, Penang.

The first year of the School has been completed. Of the 15 students who entered the School, twelve completed the course. A written and oral examination was held; straightforward "theoretical" questions were answered well but answers to more "practical" questions were disappointing. All the students leaving the School have some agricultural project in view. Applications are now being received for this year's course.

Appointment.

Mr. T. D. Marsh, Agriculturist, has been appointed to act as Senior Agriculturist, with effect from 21st December, 1938.

Leave.

Mr. A. de K. Frampton, Agricultural Officer, returned from leave on 13th January, 1939.

Mr. J. R. P. Soper, Agricultural Officer, has been granted 236 days' leave from 28th January, 1939, to 20th September, 1939, inclusive.

FERTILIZER PRICES, JANUARY, 1939.

The following are the prices at the end of January, 1939, of some of the more important fertilizers.

more important fertilizers.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia	20.6	—	—	—	72.75
Calcium Cyanamide	20.6	—	—	—	30.00
Muriate of Potash	—	—	—	50	112.00
Sulphate of Potash	—	—	—	48	112.00
Superphosphate (concentrated)	—	39	—	—	105.00
Superphosphate	—	18	—	—	60.00
Basic Slag	—	16	—	—	48.00
Rock Phosphate (Christmas Island)	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	—	11*	26 - 28‡	—	40.00
Lime	—	—	—	—	20.00

* Citric soluble.

‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical.

MARKET PRICES.

January, 1939.

Major Crops.

Rubber.—The Singapore price of rubber declined during the month. The highest quotation for No. 1 X. Rubber Smoked Sheet, loose, was 28½ cents per lb. on 1st, and the lowest 25¼ cents per lb. on 27th, the average of daily quotations being 27.26 cents per lb., as compared with 27.75 cents per lb. in December. The London average quotation per lb. was 7.98d. and New York 15.72 cents gold, as compared with 8.01d. and 16.01 cents gold respectively in December.

Prices paid for small-holders' rubber at three centres during January are shown in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, January, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades		Kuala Kangsar Perak	Kuala Pilah, Negri Sembilan				Batu Pahat, Johore.			
		18	5	12	19	26	4	11	19	26
Smoked Sheet	...	—	35.00	34.00	—	33.00	—	—	—	—
Unsmoked Sheet	...	31.00	34.20	33.00	33.00	32.00	32.84	33.10	31.45	31.50
Scrap		No purchases								

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$3.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases of rubber at Kuala Kangsar on 4th, 11th or 26th.

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	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39	—	—	105.00
Superphosphate ...	—	18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

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		18	5	12	19	26	4	11	19	26
Smoked Sheet	...	—	35.00	34.00	—	33.00	—	—	—	—
Unsmoked Sheet	...	31.00	31.20	33.00	33.00	32.00	32.84	33.10	31.45	31.50
Scrap		No purchases								

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases of rubber at Kuala Kangsar on 4th, 11th or 26th.

Palm Oil.—Prices in January were steady at around the level of those ruling during the previous month. The averages of weekly quotations per ton in December were:—palm oil £13-1-8, kernels £8-9-4. Prices in January are shown in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
January 6	£ 13. 0. 0 Liverpool	£ 8. 10. 0 Rotterdam
" 13	13. 0. 0 "	8. 12. 6 "
" 20	13. 0. 0 "	8. 12. 6 Hamburg
" 27	13. 0. 0 "	8. 10. 0 Rotterdam
Average	£ 13. 0. 0	£ 8. 11. 3

Copra.—The Singapore price of copra remained steady during January with a slight upward tendency. The average Singapore price per picul for sun-dried was \$3.80, while the mixed grade averaged \$3.00 per picul. Corresponding average prices in December were \$3.28 and \$2.97 per picul.

The price of copra cake remained steady at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in December were as follows:—Siam No. 2 Ordinary \$4.27, Rangoon No. 1 \$3.20, Saigon No. 1 \$3.65, as compared with \$4.14, \$3.95 and \$3.97 in December 1937, and \$4.40, \$3.50, \$3.90 in November 1938. The average prices of these grades during the year 1938 were \$4.26, \$3.74 and \$3.94 respectively as compared with \$4.39, \$3.75 and \$3.92 respectively in 1937.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were:—Singapore 28, Penang 32, Malacca 30, and the average prices for the year 1938, were 28, 32 and 28 respectively.

The average declared trade value of imports during December was \$3.85 per picul, as compared with \$3.85 in November, 1938, and \$3.98 in December, 1937. The average price for the year 1938 was \$3.93 as compared with \$4.00 in 1937 and \$3.58 in 1936.

Padi.—Prices paid for padi were easier in the main padi growing areas of Perak and Kedah. In Kedah the price per 100 gantangs (gallons) was between \$7 and \$8; in North Perak it was from \$11 to \$12. The price in Central and South Perak was between \$9 and \$12. Malacca and Negri Sembilan prices were lower, from \$7 to \$10.75; Pahang \$8.50 to \$12; Johore \$10 to \$15; Brunei \$10 to \$12.

The Government Rice Mill, Krian, Perak, paid \$2.10 per picul, and the Government, Rice Mill, Temerloh, Pahang, \$2.00 to \$2.25. Rice Mills in Kedah paid from \$1.85 to \$2 per picul.

Pineapples.—Singapore prices of canned pineapples, per case of 48 cans of 1½ lbs. each, were as follows:—G.A.Q. Spiral \$2.95, Round \$3.80, Cube \$3; Golden \$3.20, \$4.00 and \$3.25 respectively.

Business was good, the Golden grades being oversold early in the month and the prices of these grades advanced by approximately 4d. per case.

Fresh pineapples for canning were from \$1 to \$1.80 per 100 in Singapore. In Johore Bharu the prices were:—first quality \$1.20, second \$1, third 80 cents. In Selangor from 50 to 80 cents per 100 fruits was paid.

Beverages.

Tea.—Seven consignments of Malayan lowland tea, comprising 474 packages, were sold in the London market during January, at prices ranging between 10½d. to 1s. 0¼d. per lb., the average price being 11.68d. per lb. Five consignments of tea from Cameron Highlands, comprising 390 packages were also sold in London at prices ranging between 1s. 2d. and 1s. 2¾d. per lb., the average being 1s. 2.30d. per lb.

According to *The Tea Brokers' Association of London Reports* for January, the average London prices per lb. realized during the month for tea from other countries were as follows:—Ceylon 1s.2.06d., Indian Northern 1s.1.18d., Indian Southern 1s.1.72d., Sumatra 10.65d., Java 11.70d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 24th January, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 76, Medium Grown Teas 68, Low Grown Teas 63.

Coffee.—Liberian coffee was quoted in Singapore throughout the month at \$14.50 per picul. Excelsa varied between \$10.00 and \$10.50, the average quotation being \$10.33. Robusta was quoted throughout the month at \$6.50 per picul.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$13.50 to \$11.62, and for Sourabaya coffee \$9.50 to \$7.19, the price within these figures depending upon quality.

Spices.

Arecaanuts.—The averages of Singapore Chamber of Commerce quotations per picul were:—Best \$7.62, Medium \$7.25, Mixed \$7.00.

The averages of highest and lowest quotations per picul in Singapore were as follows:—Splits \$10.06 to \$7.81; Red Whole \$7.75 to \$5.75; Sliced \$6.12 to \$4.37; as compared with \$7.25 to \$4.75, \$6.80 to \$5.55, and \$9.35 to \$6.90 respectively in December.

Pepper.—Prices showed an upward movement during the month. Average prices per picul in Singapore were as follows:—Singapore Black \$8.50, Singapore White \$12.37, Muntok White \$12.62 as compared with \$8, \$11.70 and \$11.95 respectively in December.

Nutmegs.—Penang dried nutmegs were sold for \$18 per picul. The Singapore prices for both 110's and 80's were quoted at \$28 per picul.

Mace.—In Singapore Siouw was quoted nominally at \$80 per picul and Amboina at \$60. In Penang, locally produced mace, dry, was sold for \$70 per picul.

Cloves.—The nominal price in Singapore for both Zanzibar and Amboina cloves was \$40 per picul. Penang cloves, dried, sold in Penang for \$45 per picul.

Cardamoms.—The price of green cardamoms as quoted in *The Ceylon Chamber of Commerce Weekly Report* for 30th January, 1939, was from Rs. 1.10 to Rs. 1.30 per lb.

Miscellaneous.

Derris.—Average prices in Singapore for January remained unchanged at the previous month's level, viz: for root sold on basis of ether extract \$8 to \$10 per picul; root sold on basis of rotenone content \$17 to \$19 per picul. The demand shows a slight improvement.

Gambier.—Singapore prices remained at December levels: Cube No. 1 \$15 per picul, Block at \$7 nominal per picul.

Sago.—The Singapore price of Pearl sago appreciated by 10 cents per picul in the second fortnight of January, the average for the month being \$3.75 as compared with \$3.70 in December. Flour, Sarawak Fair, averaged \$2.19 per picul as compared with \$2.13 in December.

Tapioca.—Prices in Singapore remained throughout the month at the following levels per picul: Flake Fair \$3.90, Seed Pearl \$3.90, Pearl Medium \$4.50.

Tobacco.—Prices of locally grown tobacco were lower in most States. Kelantan prices remained high, first grade being from \$100 to \$160 per picul. In Malacca the price was easier, from \$18.50 to \$20.50 per picul according to quality. The three grades in Kedah were sold as follows per picul:—\$35 to \$38, \$25 to \$26, \$14 to \$19. In Perak South \$24 to \$28, \$16 to \$22, \$10 to \$18; Central Perak \$25.80, \$18.50, \$9.25; Province Wellesley and Penang, 1st grade \$34.50, 2nd grade \$27; Negri Sembilan \$20 to \$50, \$15 to \$45, \$15 to \$40. In Johore Central dried leaf was from \$5 to \$20 per picul, prepared \$20 to \$80.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

December, 1938.

Malaya.—The imports of foreign rice during December were 62,391 tons,† exports were 21,674 tons; net imports were therefore 40,717 tons, as compared with 43,340 tons in November.

Gross imports during the year 1938 were 814,868 tons, exports were 202,474 tons, net imports being 612,394 tons, as compared with 573,063 tons in 1937.

Of the imports during December, 50 per cent. were consigned to Singapore, 17 per cent. to Penang, 6 per cent. to Malacca, 21 per cent. to the Federated Malay States and 6 per cent. to the Unfederated Malay States. The foreign imports, by countries of origin were as follows (in tons, percentages in brackets):—Siam 43,971 (70.5), Burma 15,773 (25.3), French Indo-China 1,817 (2.9), elsewhere 830 (1.3). During the year 1938 the foreign imports by countries of origin were:—Siam 529,389 (65.0), Burma 251,228 (30.8), French Indo-China 21,567 (2.6), elsewhere 12,684 (1.6).

Of the exports during December, 81 per cent. were consigned to the Netherlands Indies and 19 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 16,704 (77.1), Burma 42,538 (21.0), French Indo-China 5,875 (2.9), parboiled 534 (0.3), Malayan 31 (0.1). The figures for the year 1938 were as follows:—Siam 152,754 (75.4), Burma 42,538 (21.0), French Indo-China 5,875 (2.9), parboiled 534 (0.3), Malayan production 773 (0.4).

Net imports of rice during December, by countries of origin, were, in tons:—Siam 27,267, Burma 11,422, French Indo-China 1,259, elsewhere 769.

India.—Foreign exports of rice, January to November inclusive, amounted to 242,000 tons as compared with 675,000 tons in 1937,¶ a decrease of 64.1 per cent.

Of these exports 2.1 (3.9) per cent. were to the United Kingdom, 3.3 (5.6) per cent. to the Continent of Europe, 38.4 (29.0) per cent. to Ceylon, 5.0 (21.0) per cent. to the Straits Settlements and the Far East, and 51.2 (40.5) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

According to the second rice forecast of All-India for the season 1938-39, the total area under rice is 69,837,000 acres, as against 69,131,000 acres (revised) at this time last year, or an increase of 1 per cent. Weather conditions have not been generally favourable, but the present condition of the crop is reported to be, on the whole, fair.

* Abridged from the Rice Summary for December, 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

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† Ton = long ton (2,240 lbs.)

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Burma.—Foreign exports of rice from 1st January to 21st December 1938 amounted to 3,041,668 tons, as compared with 3,162,402 tons in 1937, a decrease of 3.8 per cent. Of these exports, 41.1 (43.9) per cent. were to India, 11.2 (9.6) per cent. to the United Kingdom, 9.2 (11.7) per cent. to the Continent of Europe, 12.0 (11.7) per cent. to Ceylon, 14.5 (14.9) per cent. to the Straits Settlements and the Far East, and 12.0 (8.2) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

Average December prices in rupees per 100 baskets of 75 lbs. each in Rangoon were:— Big Mills Specials 189, Small Mills Specials 203.

According to the third forecast of the rice crop in Burma for the year 1938-39, the area sown is estimated at 12,808,900 acres, a decrease of 135,700 acres, or 1 per cent. as compared with the final figures for the previous year. The area estimated as destroyed is 169,400 acres, which is 184,100 acres less than last year; three-fourths of the destroyed area is in Upper Burma. The area likely to mature is 12,639,500 acres, an increase of 48,000 acres over the area actually matured last year.

Practically all the principal rice-growing districts of Lower Burma report condition figures considerably higher than those given in the Season and Crop Report for 1937-38, the general condition figure being 90. In Upper Burma where the area likely to mature is short by 57,200 acres, the general condition figure is 91. The condition figure for the country is now 97 as against 93 at this time last year.

The exportable surplus is at present estimated at 3,500,000 tons of rice and rice products which may be taken as the equivalent of about 4,730,000 tons of padi.

Siam.—Exports of rice and rice products from Bangkok during October were 106,421 tons, giving a total of 1,247,654 tons for the first ten months of 1938, as compared with 778,070 tons in 1937.

The crop conditions at the end of November, 1938, may be summarized as follows:— The cultivated area exceeds the second report's figure by 347,876 acres, making a total rice acreage of 7,533,267 acres, of which 694,398 acres (9.2 per cent.) are reported damaged. About 1,052,925 acres have been harvested, with an approximate outturn of 567,251 tons of padi.

According to the first forecast of the rice crop of Siam for the season 1938-39, the total planted acreage is estimated at 8,860,000 acres, and the area damaged at 1,060,000 acres. The total outturn is calculated at 4,898,214 tons of padi. The surplus available for export, including a small carry-over from last year, is estimated at 1,690,476 tons of rice and rice products.

Formosa.—The area and yield of the second rice crop of Formosa for 1938 are estimated at 847,000 acres and 694,000 tons, a decrease of 5 per cent. in area, but an increase of 3 per cent. in yield as compared with 1937.

French Indo-China.—Entries of padi into Cholon from 1st January to 15th December 1938 were 938,876 tons, as compared with 1,352,955 tons in 1937, a decrease of 30.6 per cent. Exports of rice during this period were 1,042,898 tons, as compared with 1,471,190 tons in 1937, a decrease of 29.1 per cent.

In November, there was a steep fall in the price of rice, particularly in the second fortnight. Prices fell from \$3.39 per picul to \$3.15 on 15th and closed at \$2.59. Padi prices declined, but less rapidly. From \$2.25 per picul prices fell to \$2.21 on the 15th, and to \$2.00 on the 30th.

Ceylon.—Imports of rice in 1938 amounted to 522,451 tons, as compared with 515,932 tons in 1937, an increase of 1.3 per cent. Of these imports 18.6 (17.2) per cent. were from British India, 67.8 (70.2) per cent. from Burma, 0.2 (0.6) from the Straits Settlements, and 13.4 (12.0) per cent. from other countries. The figures in brackets are for the corresponding period of 1937.

Europe and America.—Shipments of rice from the East to Europe from 1st January to 1st December were 1,156,256 tons, as compared with 1,058,783 tons in 1937, an increase of 9.2 per cent. Of these 39.7 (40.2) per cent. were from Burma, 47.3 (53.8) per cent. from Saigon, 11.8 (4.4) per cent. from Siam, and 1.2 (1.6) per cent. from Bengal. The figures in brackets are for the same period of 1937.

Shipments for the Levant from 1st January to 23rd November were 29,030 tons, as compared with 16,218 tons in 1937, an increase of 79.0 per cent.

Shipments for Cuba, West Indies and America from 1st January to 15th November were 169,848 tons, as compared with 218,207 tons in 1937, a decrease of 22.2 per cent.

MALAYAN AGRICULTURAL EXPORTS, NOVEMBER, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Nov. 1937	Jan./Nov. 1938	November 1937	November 1938
Arecanuts ...	30,084	27,005	31,399	2,254	3,131
Coconuts fresh ...	95,223†	86,654†	101,818†	7,332†	13,206†
Coconut oil ...	39,762	36,104	44,032	3,154	5,241
Copra ...	75,592	65,946	64,589	9,150	13,999
Gambier, all kinds ...	1,955	1,889	1,420	244	188
Copra cake ...	15,026§	14,167§	6,486§	1,662§	1,116§
Palm kernels ...	7,312	6,817	8,421	1,399	1,151
Palm oil ...	42,787	39,552	49,866	4,013	2,848
Pineapples, canned ...	80,502	75,401	68,669	3,862	4,060
Rubber ...	503,127¶	452,915¶	24,238¶	43,748¶	335,658¶
Sago,—flour ...	15,478	13,475	3,832	359	217
„ —pearl ...	3,759	3,507	3,953	388	385
„ —raw ...	8,256*	7,583*	4,823*	780*	495*
Tapioca,—flake ...	1,058	1,007	893	83	105
„ —flour ...	2,393*	2,103*	2,843*	254*	220*
„ —pearl ...	18,786	15,491	16,495	1,470	1,416
Tuba root ...	573	549	588	34	93

† hundreds in number.

* net imports.

¶ production.

§ gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938			Palm Oil		Palm Kernels	
			F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	...	...	2,241.7	1,809.2	333.7	232.0
February ...	...	...	2,040.4	1,457.1	370.4	261.0
March ...	...	...	2,359.6	1,843.1	446.8	344.0
April ...	...	...	1,963.7	1,122.6	353.6	218.0
May ...	...	...	1,491.7	1,480.7	274.8	258.0
June ...	...	...	1,773.5	1,781.2	315.9	247.0
July ...	...	...	2,546.5	2,134.2	450.8	311.0
August ...	...	...	3,587.4	2,798.1	587.8	437.0
September ...	...	...	3,415.9	1,779.2	591.4	289.0
October ...	...	...	2,817.9	2,056.3	483.0	304.0
November ...	...	...	2,451.6	1,934.3	450.1	297.0
December ...	...	...	2,289.1	2,391.7	450.6	422.0
Total ...			28,979.0	22,087.7	5,158.9	3,620.0
Total January to December, 1937 ...			27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 31st December, 1938, were palm oil 2,361 tons, palm kernels 887 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 31st DECEMBER, 1938.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (2)	Actual area during the month Acreage (3)	Percent- age of (3) to (2) (4)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED						AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7) + (9) (13)	Percent- age of (13) to (2) (14)		
				ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		On estates which have partly ceased tapping				Acreage (11)	Percent- age of (11) to (2) (12)				
				Acreage (5)	Percent- age of (5) to (2) (6)	Otherwise than under rotational systems		Under rotational systems							
						Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)						
S. S.—															
Province Wellesley ...	43,377	19,565	45.1	932	2.1	14,773	34.1	8,107	18.7	456	1.1	23,812	54.9		
Malacca ...	121,381	55,612	45.8	4,925	4.1	33,349	27.5	27,495	22.6	2,057	1.7	65,769	54.2		
Penang ...	2,478	1,198	48.3	nil	nil	1,220	49.3	60	2.4	9	0.4	1,280	51.7		
Singapore ...	32,197	13,364	41.5	5,138	16.0	10,148	31.5	3,547	11.0	161	0.5	18,833	58.5		
Total S.S. ...	199,433	89,739	45.0	10,995	5.5	59,490	29.8	39,209	19.7	2,683	1.3	109,694	55.0		
F. M. S.—															
Perak ...	285,655	151,533	53.0	10,199	3.6	73,714	25.8	50,209	17.6	7,034	2.5	134,122	47.0		
Selangor ...	320,984	192,619	60.0	6,739	2.1	59,005	18.4	62,621	19.5	6,875	2.1	128,365	40.0		
Negri Sembilan ...	257,299	134,084	52.1	14,694	5.7	60,772	23.6	47,749	18.6	7,207	2.8	123,215	47.9		
Pahang ...	86,751	41,553	47.9	9,024	10.4	24,845	28.6	11,329	13.1	6,832	7.9	45,198	52.1		
Total F.M.S. ...	950,689	519,789	54.7	40,650	4.3	218,336	22.9	171,908	18.1	27,948	2.9	430,900	45.3		
U. M. S.—															
Johore ...	477,153	261,782	54.9	22,159	4.6	124,771	26.2	68,441	14.3	33,208	7.0	215,371	45.1		
Kedah ...	195,802	109,723	56.0	9,617	4.9	34,138	17.5	42,324	21.6	5,974	3.1	86,079	44.0		
Kelantan ...	31,261	18,209	58.2	403	1.3	7,580	24.3	5,069	16.2	2,649	8.5	13,052	41.8		
Trengganu (b) ...	4,817	3,037	63.0	nil	nil	97	2.0	1,683	35.0	74	1.5	1,780	37.0		
Perlis (c) ...	1,389	592	42.6	323	23.3	310	22.3	164	11.8	98	7.1	797	57.4		
Brunei ...	5,826	2,486	42.7	nil	nil	2,637	45.2	703	12.1	264	4.5	3,340	57.3		
Total U.M.S. ...	716,248	395,829	55.3	32,502	4.5	169,533	23.7	118,384	16.5	42,267	5.9	320,419	44.7		
Total MALAYA ...	1,866,370	1,005,357	53.9	84,153	4.5	447,359	24.0	329,501	17.6	72,898	3.9	861,013	46.1		

Notes:—(a) The acreage shown in column (11) is included in columns (5) and (7).
(b) Registered companies only.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF DECEMBER, 1938 IN DRY TONS.

State or Territory	Stocks at beginning of month 1		Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports		Exports including re-exports				Stocks at end of month		Consumption 3						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Dec. 1938	during the month	Jan. to Dec. 1938	during the month		January to Dec. 1938		Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Dec. 1938					
								Foreign	Local	Foreign	Local										
MALAY STATES:—																					
Federated Malay States	2	6,047	23,887	10,102	120,738	2,564	54,330	Nil	Nil	11	12	8,829	2,123	136,453	41,273	17	20	21	196		
Johore	...	2,052	8,800	4,552	58,213	1,768	32,066	Nil	40	Nil	410	1,731	3,298	31,965	56,175	...	...	...	...
Kedah	...	191	5,194	2,545	31,336	452	9,352	Nil	Nil	Nil	Nil	1,363	985	18,960	20,026	...	...	...	...
Perlis	...	11	31	12	144	16	237	Nil	Nil	Nil	Nil	Nil	97	Nil	363	...	...	...	...
Kelantan	...	399	666	295	4,102	345	6,601	Nil	Nil	Nil	Nil	319	298	3,370	7,331	...	...	...	...
Trengganu	...	26	281	107	2,773	58	1,449	Nil	Nil	Nil	Nil	Nil	132	5	4,156	...	...	...	...
Brunei	...	7	81	44	531	26	734	...	...	...	...	Nil	58	...	1,240	...	...	...	...
Total Malay States	...	8,733	38,940	17,657	227,027	5,229	104,772	Nil	40	Nil	410	12,242	6,921	190,793	130,569	...	7,475	43,944	17	196	
S. SETTLEMENTS:—																					
Malacca	...	1,726	2,132	945	12,582	604	5,995	Nil	Nil	Nil	Nil	1,841	...	25,519	1,708	2,340	
Province Wellesley	...	1,503	917	406	4,798	134	2,307	Nil	4,735	...	83,848	938	1,089	
Penang	2,055	4,066	15	18	208	84	898	1,863	6,747	29,443	31,634	1,969	3,187	15	...	
Singapore	3,386	21,761	291	115	1,605	41	575	5,709	126,108	126,108	131,634	10,823	...	225,251	4,183	17,760	282	32	
Labuan	...	26	Nil	Nil	Nil	7	131	35	...	550	...	Nil	...	Nil	9	Nil
Total Straits Settlements	5,441	29,082	3,355	1,484	19,193	870	9,906	7,607	6,717	150,161	131,634	20,559	Nil	336,112	Nil	...	6,152	23,602	3,726	42	316
Total Malaya	5,441	37,815	42,295	19,141	246,220	6,099	114,678	7,607	6,757	156,161	132,044	32,901	6,921	330,911	130,569	...	6,152	31,077	47,670	49	512

*Ocean Shipments from Malaya of rubber directly consigned from F.M.S.

†Exports of rubber from F.M.S.

TABLE II
DEALERS' STOCKS, IN DRY TONS

Class of Rubber	Fede- rated Malay States		Penang		Pro- vince Wellesley		Johore		Kedah	
	23	24	25	26	27	28	29	30	31	32
DRY RUBBER	4,226	17,296	2,096	2,460	1,820	56	...	...	...	...
WET RUBBER	557	464	91	195	335	76	...	...	...	...
TOTAL	4,783	17,760	3,187	2,655	2,155	132	...	...	...	...

TABLE IV
DOMESTIC EXPORTS

Class of Rubber	For month		Jan. to Dec. 1938	
	30	31	1938	34
DRY RUBBER	21,726	352,322	...	...
WET RUBBER	7,174	123,353	...	...
TOTAL	28,900	475,675	...	...

Note:— 1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e., Column (1) = Columns (12) + (14) + (17) + (19) + (20) - (2) - (3) - (4) - (5) - (9) - (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.

5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.

6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25th January, 1939.

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1938.

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LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT				EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.						
	Means of		Absolute Extremes		At 1 foot	At 4 feet	Total.		Most in a day.		Number of days.				Total.	Daily Mean.	Per cent.		
	A.	B.	Lowest	Highest			in.	mm.	Precipitation, 4 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more							
	Max.	Min.	°F	°F	°F	°F	in.	mm.	Amt.	in.	in.	in.	in.	hrs.	hrs.				
	°F	°F	°F	°F	°F	°F	in.	mm.	Amt.	in.	in.	in.	in.	hrs.	hrs.				
Railway Hill, Kuala Lumpur, Selangor	84.4	71.2	79.8	94	68	75	73	5.22	132.6	0.78	16	16	2	4	—	—	167.10	5.39	45
Bukit Jeram, Selangor	87.3	71.7	79.5	91	70	74	74	3.49	88.7	0.74	13	12	—	—	—	—	197.20	6.36	53
Sitiawan, Perak	87.8	71.7	79.7	91	67	77	75	3.29	83.6	0.84	15	14	1	1	—	—	186.70	6.02	51
Ipoh Aerodrome, Perak	88.8	70.6	79.7	94	65	79	74	6.75	171.5	1.32	16	16	2	—	1	—	181.00	5.84	49
Temerloh, Pahang	86.4	71.1	78.7	91	68	73	74	8.39	213.1	3.20	17	13	—	8	—	—	140.80	4.59	38
Kuala Lipis, Pahang	86.2	70.3	78.3	93	66	73	74	6.43	163.3	2.38	17	15	—	9	—	—	155.15	5.00	42
Kuala Pahang, Pahang	83.0	73.5	78.3	86	71	79	76	35.66	905.8	11.15	19	16	1	—	—	—	158.35	5.11	43
Kallang Aerodrome, S'pore	85.7	74.2	79.9	90	73	80	77	10.78	273.8	2.61	20	17	3	—	—	—	146.75	4.73	39
Bayan Lepas Aerodrome Penang	86.3	72.6	79.5	90	67	79	76	3.00	76.2	0.72	13	10	2	—	—	—	214.75	6.93	59
Malacca Town, Malacca	84.7	72.9	78.8	89	71	75	75	8.46	214.9	2.12	15	13	4	—	—	—	192.00	6.19	51
Kluang, Johore	86.0	71.3	78.7	91	69	76	74	8.58	217.9	2.91	19	15	4	6	—	—	158.45	5.11	43
Mersing, Johore	82.2	72.4	77.3	85	70	75	77	26.07	662.2	7.01	24	20	—	—	3	—	148.00	4.77	40
Alor Star, Kedah	86.6	70.9	78.7	91	65	75	74	7.73	196.3	3.38	16	14	—	—	1	—	199.95	6.45	54
Kota Bharu, Kelantan	83.4	71.5	77.5	87	67	74	74	24.71	627.6	5.04	20	19	—	—	1	—	181.90	5.87	50
Kuala Trengganu, Trengganu	83.2	72.0	77.6	86	68	79	77	20.83	529.1	7.26	21	19	1	2	—	—	173.45	5.59	47
Labuan	85.1	76.1	80.6	89	72	78	79	16.35	415.3	2.89	17	16	1	—	—	—	209.20	6.75	57
HILL STATIONS.																			
Fraser's Hill, Pahang 4268 ft.	69.9	61.1	65.5	75	59	62	63	8.05	204.5	1.38	16	15	—	18	—	—	124.55	4.02	34
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	70.7	53.1	61.9	75	45	65	61	8.83	224.3	1.34	17	15	1	1	—	—	127.85	4.12	35
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	71.0	57.7	64.3	77	52	63	60	9.08	230.6	1.38	18	15	1	—	—	—	134.95	4.35	37

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE
Malayan Agricultural Journal.

MARCH, 1939

EDITORIAL.

**Plant Disease
Problems.**

Those interested in agriculture and whose residence in Malaya has extended over many years doubtless can recall outbreaks of plant diseases which, at the time, were said to threaten

the future of the industry connected with the plants on which they occurred. In every such case the nature of the disease was successfully studied and methods devised for combating the disease, the danger being thus overcome or greatly minimised.

The danger from such diseases was real enough and it is to the credit of the mycologists in this country that they succeeded in recommending measures of treatment before the disease became so widespread as to defy efforts to control it.

The successful control of plant diseases calls for ceaseless vigilance, not only by scientists, but by those engaged in agriculture, in order that any new outbreak of disease may receive attention before it has caused considerable damage to the crop. This vigilance is all the more necessary to-day, for when a crop has gained a position of importance, the damage of epidemic disease is increased as the population of plants of one kind is then great and estates are no longer isolated by jungle or other crops.

At one time agricultural enterprise in this country was confined to but one or two crops: at the present time there are a number of crops grown commercially and while none have assumed the importance of rubber, coconuts or rice in the agricultural commerce of Malaya, nevertheless they form a valuable integral part of the system of agriculture and are certain to assume an even greater degree of importance in the future. The future development of any of these smaller agricultural industries depends in large measure on the success in maintaining the crop to-day reasonably free from serious fungoid diseases.

The Notes published in this number give information on studies made during the past two years of fungus diseases on a number of crops cultivated locally. The diversity of the crops which are included in these notes illustrates our remarks above concerning possible future developments in agriculture. The Division of Plant Pathology of the Department in publishing these notes not only places on record an account of useful work but makes readily available to the reader information which otherwise might not come to the notice of the practical agriculturist.

**Malayan Rice
Production in 1938.**

The desirability of ensuring an adequate supply of rice in Malaya is fully recognised in all quarters, although there may still be divergent views as to the most effective policy to achieve this object. But whatever policy be adopted, the production of rice within the borders of this country must always remain a factor of the very greatest importance. It follows, therefore, that everything that can be done, such as improved irrigation, improved varieties of seed, will add to the attractiveness of the crop by making its cultivation more remunerative, while the development of communications, improved sanitation, and the encouragement of subsidiary industries, by adding to the amenities of the population, will encourage the colonization of areas developed for this crop.

Despite the efforts made to encourage padi cultivation by such means as outlined above, it remains a matter of difficulty to maintain the proportion of local production to total consumption, because except for isolated years of trade depression, the total amount of rice required increases annually. Thus, in 1938 net imports increased by nearly 50,000 tons while local production, due in large measure to an unsuitable season, dropped by 20,000 tons. Consequently, Malaya produced only 33 per cent. of requirements, the remainder being imported mainly from Siam and Burma.

Total consumption of rice in Malaya during 1938 exceeded 900,000 tons, the highest on record, and the cost of imports of rice exceeded \$40,000,000, the highest since 1930 when the value of imports was about 50 per cent. greater than in 1938.

The above statements are drawn from an account of the rice position in Malaya which will be found in this number. Amongst other interesting facts brought to light by this article is that although the price of all grades of rice was less in 1938 than in the previous year a greater quantity of the better grades was consumed than in 1937, so that the rice-eating population thus paid more for their requirements in 1938 than they did in the previous year.

Original Articles.

NOTES ON PLANT DISEASES IN 1937—1938

BY

A. THOMPSON,

Senior Plant Pathologist.

The following notes have been prepared from the Annual Reports of the Division of Plant Pathology 1937-1938 for publication in this Journal instead of, as previously, in a Special Bulletin containing the Annual Reports of the Research Branch. Publication of this Special Bulletin was discontinued in 1937.

In the notes below the diseases and fungi which have been investigated or recorded on crops in 1937-1938 are discussed.

Oil Palms.

1. *Stem-rot.*

The results of observations made on this disease at the Central Experiment Station, Serdang, and on estates, were summarized in 1937 and published as Bulletin No. 21, Scientific Series, in 1938. The disease has now been recorded on the majority of oil palm estates in this country but, except in areas where soil conditions are unfavourable to vigorous growth, it has not caused extensive damage and is not now looked upon as a serious menace to the industry, although when it first made its appearance some years ago the disease had affected so many palms, in the area involved, that it was looked upon with considerable disquietude.

The disease may become epidemic on areas of deep peat or in quartzite valley soils with a pan of sandy subsoil. It is less common on lateritic soils but may appear in areas with rocky outcrops in the subsoil. In palms growing well, in good soil, the disease is of minor importance, but may attack the less vigorous palms, particularly if they have, for any reason, declined in vigour or suffered a check to growth.

During recent years a general deterioration of the palms, marked by a falling off in yield and a bronzing or yellowing of the outer leaves, has occurred on a number of estates in fields of deep peat or in valley areas with subsoil sand-beds. Stem-rot has been active in some of these areas on which the incidence of the disease is likely to increase if control measures are not adopted.

In connexion with control measures, preventive painting of the surface of leaf bases is not now recommended on grounds of expense. "Hat-peg" pruning (*i.e.* leaving a fairly long portion of petiole on the stem) is a method which reduces wounding and should confer a measure of protection.

Felling and burying the stems of diseased palms is recommended as a sanitary measure. It has been found that, although the roots of adjacent palms will make contact with the buried stems, the roots are not attacked by *Fomes noxius*, the

fungus which causes the commonest form of the disease. Burial, however, may be attended by some risk if the causal fungus is *Ganoderma lucidum*—a less common cause of a form of stem-rot—or if *Ustilina zonata* is growing in the old leaf bases.

Treatment by excision of diseased tissue and protection of the exposed tissue has given good results in many cases, in that the progress of the disease in individual palms has been arrested and the life of the palms prolonged. Treatment, however, is recommended only for palms which can be expected to maintain yields in areas where "supply" palms do not succeed or are unlikely to do better than the palms they would replace.

In addition to the fungi *F. noxius* and *G. lucidum* a third fungus was recorded as the cause of a decay of the stem tissue. This fungus forms a type of mycelial growth in pure culture dissimilar to the fungi mentioned above or to that of other fungi whose fructifications have been collected from the leaf bases, e.g. *Ganoderma applanatum* var. *tornatum*, *Poria Ravenalae*, *Fomes lamaensis*, *Polystictus sanguineus* or agarics all of which are saprophytes.

It has been shown that the stem-rot fungi, *F. noxius* and *G. lucidum*, do not rapidly kill an infected palm and that, following infection, a period of from one to three years may elapse before a palm is killed. The newly recorded fungus appears to be even slower in its action than *F. noxius* or *G. lucidum*. It has not yet been identified, since fructifications have not been found, but it is probably a Polypore.

2. Leaf Diseases.

During periods of dry weather the leaves of oil palm seedlings may be attacked by weak parasites if the nursery soil becomes excessively dry. Two fungi were recorded under these conditions in 1938, i.e. *Pestalozzia palmarum* causing greyish-brown lesions, and *Helminthosporium* sp. causing a darker brown, more linear leaf spot, or a brown decay of the edges of the leaves. These fungi were also present on leaves of seedlings which developed a yellow spotting suspected to be caused by red spiders (*Tetranychus* sp?).

The fungus *Helminthosporium* was also isolated from a leaf disease of young palms growing in an area where older palms had begun to die back, due presumably to an adverse soil factor. The leaves of the young palms withered and, in some cases, the decay extended to the bud and the palms died. Rainfall was well below the average for the district about the time the trouble appeared and this may have influenced the incidence of the disease. The fungus was inoculated into the leaves of young, healthy palms, growing in another area, but it failed to cause damage, and consequently is regarded as a facultative parasite.

A curious bending of the petioles of the oldest leaves of mature oil palms occurred on a peat area. The affected petioles were of abnormal length and bent over in a curve near the point of attachment to the stem and, in some cases, the tips touched the ground to form a "tent" around the stem. The leaves were dark green in colour and the palms had made excellent growth and had yielded well up

to the time bending of the petioles occurred. The cause of the bending is not yet known, but it is perhaps suggestive that the palms had been regularly manured with rock phosphate alone for some years, and this may have contributed to a nutritional disturbance.

A leaf disease affecting about 20 acres of four-year-old palms was reported in 1937. The infection was largely confined to the younger leaves and involved anything from a few square inches of tissue to the complete frond. The fungi associated with the infection were mainly *Mycosphaerella* and *Phyllosticta*. It was considered that there was probably something in common between the origin of this outbreak and that of "Crown disease" as the palms were at an age when the latter disease is likely to appear.

3. *Moulds of Oil Palm Kernels.*

Infection by *Mucor* sp. and bacteria during the process of drying the nuts was found to occur in the bins into which the nuts are piled after depericarping. The initial heating which occurs (up to 64°C) in the bins is probably due to the action of thermophillic bacteria.

As the temperature falls *Mucor* sp. and bacteria develop on and within the shells and in some cases within the kernels. The organisms enter mainly *via* the germination pore at the end of the nut.

After separating the kernels from the shells some kernels become spotted with an exudate of a greasy substance. The tissue of these kernels is permeated by mycelium of *Mucor* sp., often forming spores in cavities formed in the tissue or in the central air space.

Other fungi isolated from mouldy kernels were *Fusarium* sp., *Aspergillus* sp., *Trichoderma* sp.

Mucor sp., however, appears to be the most commonly occurring organism in the shells and kernels.

Coconuts.

No important disease was reported during the period under review. Lightning injury, however, was again diagnosed as the cause of death or injury to groups of palms in the main coconut districts.

Pineapples.

1. *Fruitlet Brown Rot.*

A preliminary account of the fruit rots of the Singapore Canning variety of pineapple in Malaya was published in this Journal in 1937.

The affection known as "Fruitlet brown rot" in this variety also occurs locally in fruits of the Sarawak (Smooth Cayenne) variety, which is grown for home consumption in Malaya and is not canned. The yellow bacillus associated with the fruitlet-rot of the canning variety is also the prominent organism in the Sarawak variety, which appears to be highly susceptible to the disease, *e.g.* observations on fruits from two adjacent plots showed that whereas 12 per cent. of fruits of the

canning variety were lightly affected, 80 per cent. of the Sarawak fruits were so heavily blemished that most of them would be considered unfit for canning or consumption. It is perhaps significant, in view of the scanty growth of the yellow bacillus on culture media below pH 4.0, that the juice of the fruits of the canning variety was considerably more acid (pH 3.85) than that of the Sarawak fruits (pH 4.5).

2. *Fruit Collapse.*

This disease has been recorded only in the State of Johore. The cause is still obscure and all attempts to reproduce the disease, by various means, in clonal material have failed.

3. *Heart-Rot.*

This disease of young plants is characterized by a decay of the base of the "heart" leaves and the top portion or side of the stem. The trouble has occurred only in Johore and is responsible for a steady loss, monthly, of young plants on the Experiment Station and on estates, but not in sufficient numbers to cause alarm. The symptoms of the disease closely resemble those of heart-rot caused by the fungus *Phytophthora* in Hawaii, but, possibly on account of the difficulty of finding early stages of the disease, this fungus has not been isolated from the disease locally. *Fusarium* sp. and several species of bacteria, which are saprophytes, are invariably present in the decayed tissues and are the only organisms constantly isolated in culture from the rather advanced stages of the disease, which are the only stages that, so far, have been found in the field. It is more usual to find single plants affected than to find groups, or even pairs, of diseased plants, which suggests that if a parasitic organism is the cause of the disease, some factor affecting individual plants may be operating to influence susceptibility.

In view of the failure to isolate a pathogen from the diseased tissue, it was decided to study the effect of inoculation with various species of *Phytophthora* and *Pythium*. (The majority of these were kindly supplied by the Imperial Mycological Institute, Kew.). Plants of the Singapore Canning variety, growing in pots and in the field (in Selangor), were inoculated in various ways, but the disease was not reproduced. Typical symptoms, however, were produced on single leaves in the laboratory, which were placed in Roux tubes, kept moist, and inoculated on the white basal portion, using as the inoculum strains of *Phytophthora parasitica* from delphinium and tobacco, and *P. palmivora* (cacao group). No result was obtained with *P. meadii* (rubber), *P. meadii* var. *ananaphthorus* (pineapple), *P. palmivora* (rubber), *Pythium splendens* var. *hawaiianum* (from *Piper* betle), and *Pythium complectens* (durian).

Suckers and crowns were placed in coplin jars, so that the bases were in water, and were inoculated with the fungi mentioned above. One young plant, inoculated with *P. palmivora* (cacao group), developed heart-rot, but the remainder were not affected. All these plants formed roots and were inoculated again at intervals, but without effect.

The results of these inoculations indicate that *Phytophthora* and *Pythium* are not aggressive parasites of Singapore Canning pineapple plants, but that, under certain conditions, strains of *P. parasitica* and *P. palmivora* (cacao group) can attack the tissues of leaf and stem.

In attempts to re-isolate the fungus from the successful leaf inoculations, it was found that re-isolation succeeded only when cultures were made soon after the tissue began to show signs of invasion. After 10 to 12 days, however, when the successfully inoculated leaves began to lose colour, only *Fusarium* sp. and bacteria were obtained from the tissue at the margin of the basal rot. Subsequent inoculations showed that these were saprophytes.

It is quite possible, therefore, that the failure to isolate *Phytophthora* from the diseased plants in Johore may be due to the fact that the tissue is rapidly invaded by secondary organisms, and final proof that *Phytophthora* (*P. parasitica*? which occurs in Johore on other crops) is the causal organism must await isolation of the fungus from diseased material. The fact that the rot is well advanced before the leaves begin to lose colour renders it difficult to discover early stages of infection, particularly when the disease does not appear necessarily to spread to adjacent plants in which early stages could be looked for.

Tea.

1. Red-root Disease.

Red-root disease caused by *Ganoderma pseudoferreum* appears to be the most common root disease of lowland tea. The disease usually occurs in scattered patches in which the bushes wilt rather suddenly, so that in an infected area a group of from 15 to 50 bushes, which were normal in appearance at the beginning of the week, may be withered and dead by the end of the week.

Infection can frequently be traced to a jungle or shade-tree stump, but occasionally, when only one or two bushes are affected, the source of infection may not be obvious. The common shade-trees *Albizzia* and *Gliricidia* are both susceptible to attack.

The disease may also arise in a living shade-tree and spread to the tea bushes by root contact. Some typical instances of this were observed in one field at the Central Experiment Station, Serdang, where a few of the *Albizzia* shade-trees began to show signs of root disease and, later, groups of tea bushes around these trees died from red-root disease. It was found that the disease had spread outwards along the lateral roots of the shade-trees to a distance of about 15 feet and had infected the roots of those tea bushes whose roots were in contact with diseased *Albizzia* roots.

In another instance a lateral root of an *Albizzia* tree had become infected through contact with a diseased patch and the disease had extended about 10 feet along this root in the direction of the tap root. (Plate 1, Fig. 1.). A few tea bushes in a line had died as a result of infection through contact of their roots with the diseased *Albizzia* root.

The rather sudden wilting of affected tea bushes appears to be due to the fact that, frequently, only one or two of the lateral roots on one side of a bush are first infected. The fungus travels along these roots to the tap root and then up to the collar. The unaffected lateral roots provide food until the fungus girdles the tap root and the underground portion of the stem, after which the cortical tissues of the stem at the collar appear to be "ringed" rather suddenly and the leaves wilt. It has not yet been determined how soon, after the mycelium encircles the collar underground, penetration into the cortex occurs, but specimens of young "supply" plants have been found on a few occasions with no signs of wilt, although the tap roots and the collar below soil level were encircled with the skin of red mycelium under which the cortex at the collar was still healthy.

The lateral roots of *Albizzia* can extend to a considerable distance from the trunk, and if they become infected with red-root disease can undoubtedly spread the disease to the tea bushes so that, from the root disease aspect, this useful shade tree is perhaps an "undesirable."

It appears, however, that the presence of root disease in *Albizzia* would be disclosed before extensive spread occurred and this would facilitate early isolation of the diseased patches by trenching.

The mycelium of the red-root fungus does not grow on roots exposed to the air and it has recently been suggested⁽¹⁾ that a method of controlling this disease, in tea, by exposing the upper lateral roots and the tap-root of bushes surrounding a diseased patch might give better results than trenching. (Plate 1, Fig. 2.). An investigation of this method was made at Serdang, but it would appear that the presence of infected shade tree roots, between the bushes, might render the method less safe than the trenching method. The exposure method has not harmed the bushes so treated, but it is difficult to apply in stiff soil.

2. Other Root Diseases.

Ustilina zonata also causes root disease in tea bushes and appears to be the most common cause of root disease at Cameron Highlands.

In lowland tea, at the Central Experiment Station, Serdang, the bushes have not been affected in large groups; usually only single bushes have been attacked at any one time. The disease is invariably associated with old stumps of *Grevillea* shade-trees which were cut down some years ago. On these stumps fructifications of the fungus are freely produced and the spores are liable to spread infection.

Brown-root disease and *Rosellinia* root-rot are fairly common on tea at Cameron Highlands, where they are of more importance on tea seed-bearers than on bushes in the field. The root exposure method might be of value in checking *Rosellinia* if the mycelium reacts like that of *G. pseudoferreum*.

It has definitely been established, by comparison of cultures from roots affected by brown-root disease with cultures from fructifications developed on these roots, that the causal fungus of brown-root disease of tea is *Fomes noxius*.

(1) J. S. Vollema. De Bergcultures XI. 43. 1937.

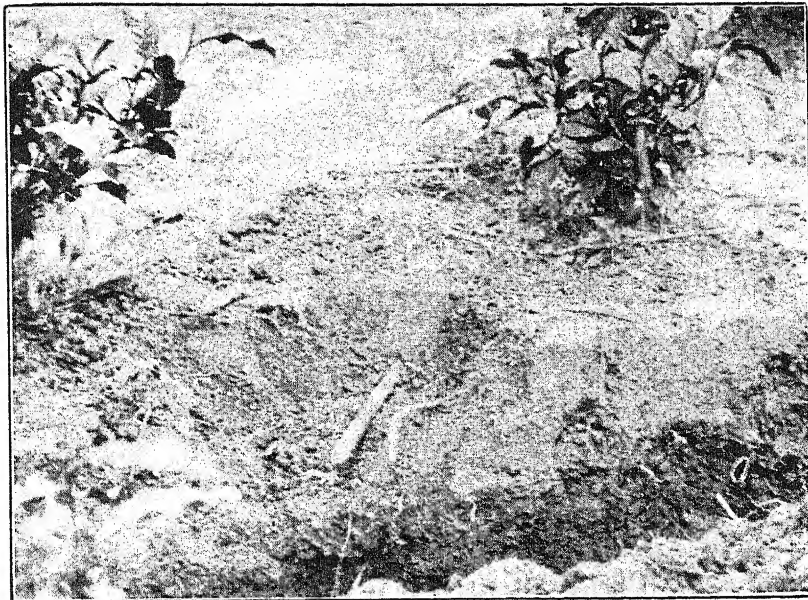


Fig. 1. Lateral root of Albizzia infected with red-root disease and capable of infecting the bushes in the background.



Fig. 2. Tea bush with soil removed from lateral roots and collar to check red-root disease.

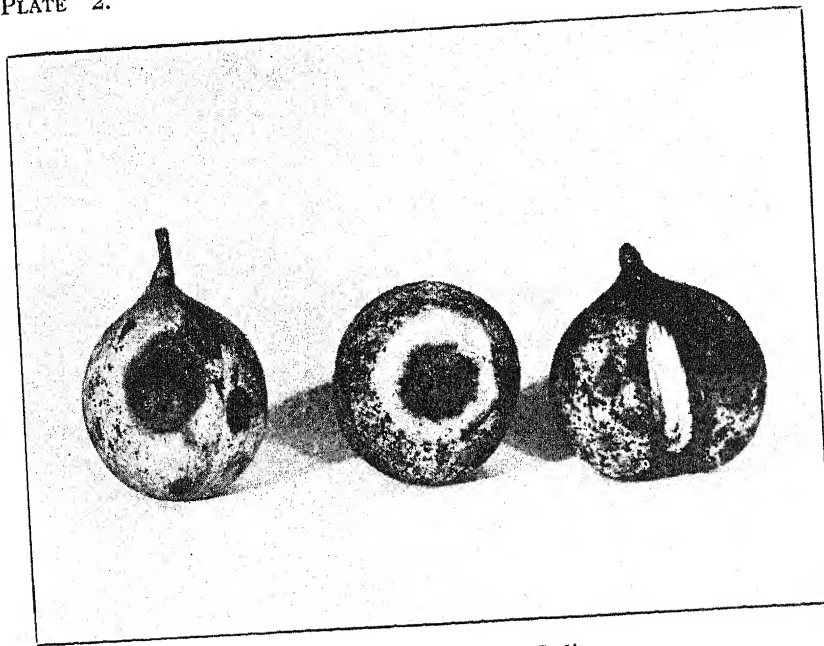


Fig. 3. Nutmeg Fruit-Split.
The skin of the centre fruit has been shaved to show the internal rot.



Fig. 4. *Fomes noxius* and a black-line fungus on
Avocado.

Derris.

Curiously enough this plant, which yields a valuable insecticide, is more subject to insect attack than to attack by fungi.

When grown in soil infected with *Fomes lignosus* the roots may become covered with the white rhizomorphs of this fungus which, however, appear to remain entirely on the surface, and, up to now, there is no authentic record of damage to derris by *F. lignosus*. The matter is of some importance in view of the fact that derris is frequently grown as a catch crop with young rubber trees.

Fruits.

(A). DURIAN (*Durio zibethinus*).

A root disease of eight-year-old trees occurred on an estate in Singapore, and resulted in the death of about 50 trees. The fungus *Pythium complectens* was isolated from the roots and proved on inoculation to be parasitic on durian root and stem tissue. It was concluded that, on this occasion, the fungus was acting as a facultative parasite of the roots of durian trees growing on a sloping area in which erosion had occurred to an extent sufficient to affect the vigour of the trees. It was also shown that *P. complectens* is capable of acting as a vigorous wound-parasite of the stem of durian to cause patch canker.

The leaves of seedlings and bud-grafted plants of durian at Serdang were attacked by anthracnose caused by *Colletotrichum* sp., and by rim-blight caused by a species of *Phyllosticta*. The soil in which the affected plants were growing was rather stiff, but had been well manured with compost.

An incurling of the young leaves also occurred on this area, but was possibly due to attack by red spider.

Trouble was experienced on various Agricultural Stations from a die-back of the scion of bud-grafted plants. The cause was traced to decay of the snag of the stock by *Diplodia* sp., which occasionally extended below the junction of stock and scion and cut off food supplies to the latter so that it wilted and died.

Treatment of the snag after cutting, by applying cow-dung and clay mixture or whitewash and cryptonol alone and in combination, is being tried as a preventive measure.

(B). RAMBUTAN (*Nephelium lappaceum*).

(1) Mildew.

A splitting of maturing fruits combined with a decay of the outer skins and finally decay of the exposed pulp is a trouble which has from time to time occurred in rambutans. Numerous specimens have been examined but no definitely parasitic fungus was observed until 1938, when specimens of young green fruits were received

from Johore. The skin of the fruits was decayed with a brown rot on one side and had split to expose the pulp.

A mildew was present on the decayed tissue and was identified as *Oidium* sp., a parasitic fungus not hitherto recorded on *Nephelium* spp. In shape and size (30 x 24 microns) the spores of the fungus resemble *Oidium heveae*, but inoculation of young rubber leaves gave no result. This may have been due to desiccation of the spores, which are short lived.

This fungus was also recorded on young rambutan plants at Cheras, Selangor, causing a black, wet rot which destroyed the younger leaves.

(2) *Seedling Wilt.*

A decay of the middle portion of the stems of young seedlings occurred at Bukit Mertajam. About 2 inches of the cortex and wood of the stems was affected and the leaves wilted. The only fungus found in the tissue was *Diplodia* sp., indicating that a weakening of resistance of the tissue due to some outside factor had occurred. There was a possibility that sodium nitrate, applied as a manure in liquid form, had started the trouble, but a disease of this nature is more often due to "sun-scorch."

(3) *Stem and Branch Disease.*

The disease reported under this heading in 1936, in which the bark becomes raised and split and the branches become "warty" and sometimes swollen at the affected points, appears to be very common, but does not do serious injury to well grown trees.

Fungi including *Nectria*, *Limacina*, *Fusarium*, *Diplodia* and *Pestalozzia* sp., with very large spores, have been isolated from the affected bark and, along with two species of bacteria isolated from the outer cortex, have repeatedly been inoculated into healthy trees, but without result. Failure to reproduce the disease also occurred when affected bark was used as the inoculum.

(C). CITRUS.

(1) *Canker (Phytophthora citri).*

Bacterial Canker is perhaps the most prevalent disease of citrus in Malaya. It was recorded this year on Italian lime at Serdang in a form not quite typical of the trouble as it occurs on other varieties, in that the cankers are fewer and larger and tend to cause circular lesions on the leaves of this fairly resistant variety.

Isolations from the leaves gave two species of bacteria, of which one resembled *P. citri* and gave a positive result on inoculation.

Inspections for canker of citrus species growing at Cheras, Serdang and Kuala Lumpur were made in October and December 1938, and the following list of species and varieties resistant and susceptible to canker was drawn up.

Very Susceptible	Susceptible	Resistant (r). or Immune (i).
Japanese citron Rough lemon Local lime	Saramaca citron Grape fruit Lemon Villa Franca Lemon Villa Granda <i>Citrus hystrix</i>	Tahiti lime (r) <i>Citrus sunkii</i> (i) Satsuma orange (r) Italian lime (r) Limau telur buaya (i) <i>Triphasia aurantifolia</i> (i) Pomelo (r) Sour orange (r) Valencia late orange (r) Mediterranean sweet orange (r) Mandarin orange (r) Kumquat (r)

The varieties shown above as immune are so listed because canker was not recorded on them. Some may be slightly susceptible, as it is doubtful if any citrus variety is absolutely immune.

(2) *Bark-rot.*

A serious bark-rot leading to canker or death of individual branches of the Mediterranean sweet orange occurred at Serdang. The disease appears to be identical with bark-rot of citrus recently reported from Java, where it is ascribed to *Fusarium* sp. with a perfect stage—*Nectria coccicola*.

A *Fusarium* sp. which forms a *Nectria* stage in pure culture was isolated from the disease at Serdang, but inoculations have, so far, given no result.

One tree was treated by excision of diseased cortex and application of Izal 2 per cent. Callus formation proceeded satisfactorily and the affected branches (one of which was almost ringed by the disease) are recovering. Branches of untreated trees died.

(3) Pomelo seedlings are sometimes heavily encrusted with a diaspid scale insect. The scale is frequently parasitised by an entomogenous fungus, red in colour. This fungus has been identified as *Calonectria diploa* (B & C) Wr. with a conidial stage—*Fusarium juruanum* P. Henn. It was also recorded on scale of hevea leaves.

(4) *Sphaerostilbe repens* was recorded in 1938 on lemon trees killed by a root disease at Kuala Kangsar, Perak.

(D). BANANA.

Panama disease continues to give trouble in certain areas in Pahang and Negri Sembilan. From the description of symptoms and the presence of bacteria in the first imperfect specimens received from these areas in 1938 it was thought that bacterial wilt, (*B. solanacearum*), which causes serious damage to bananas in the

Western tropics, might be present. The bacteria were later shown to be secondary saprophytes and further investigation proved that Panama disease (*Fusarium cubense*) was the cause of the trouble. The varieties affected were Pisang Embun and Pisang Rastali.

Pisang Serendah (*Musa Cavendishii*) was badly attacked by nematodes at Bukit Mertajam in 1938. The roots were affected in patches which turned black, the leaves began to wither prematurely, growth was stunted and the fruits were few and small. The record is of interest because, in the West Indies, this variety is said to be less liable to attack by nematodes than other varieties.

(E). AVOCADO.

The fungus *Fomes noxius*, which causes oil palm stem-rot, was isolated from a brown decay at the base of the stem of an avocado pear tree which was blown over at Serdang. The tap root and one lateral of this tree were also attacked by a black-line fungus resembling *Ustilina zonata*, but the other roots were healthy. (Plate 2, Fig. 4.).

(F). PAPAYA.

The fungus *Helminthosporium papayae* and *Mycosphaerella caricae* were associated with a leaf disease of the imported Morado variety of papaya at Serdang. The weather had been dry for some weeks and this factor undoubtedly influenced the development of these fungi, which damaged large areas of the leaves. The disease, which soon disappeared when rainy weather began, appears to be common in the Philippines, but has not previously been recorded in Malaya.

Cacao.

The cacao trees at Serdang were inspected periodically so that early action could be taken if *Phytophthora* pod-rot, Witches Broom (*Marasmius perniciosus* Stahel), or other major disease should appear. Up to now no serious disease has occurred. All the pods, however, are rendered very unsightly as a result of attack by an insect (*Helopeltis*).

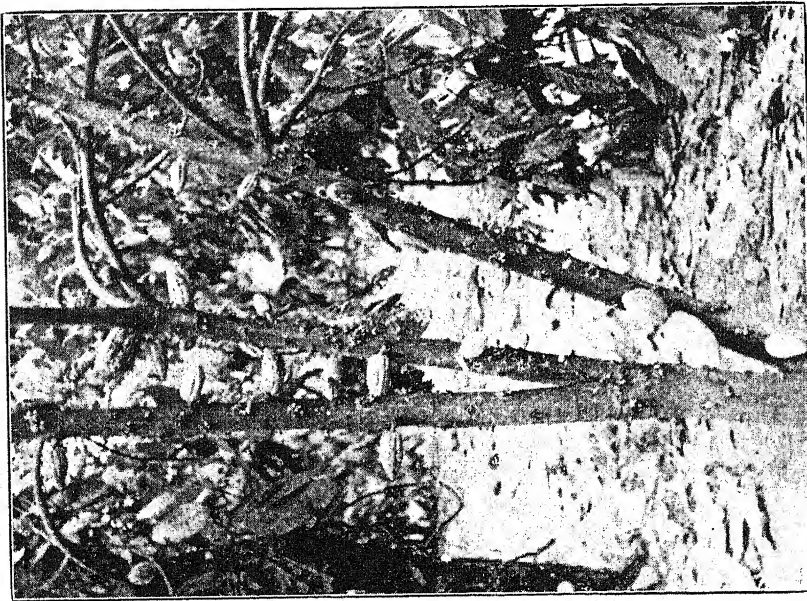
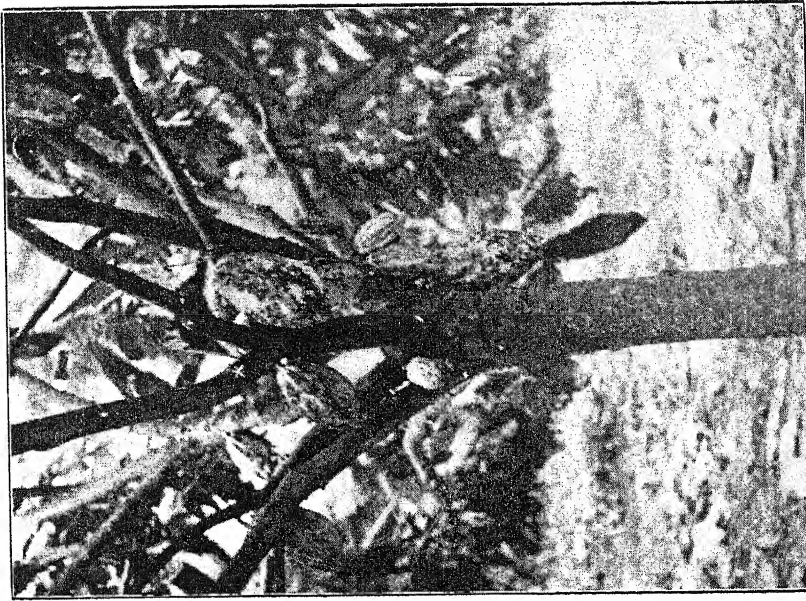
The insect damage is superficial and possibly may not be so markedly evident if secondary fungi could be prevented from attacking the injured epidermal tissue. The principal fungi which have been isolated from the superficial lesions on the pods are species of *Fusarium* and the Anthracnose fungus *Colletotrichum*. (Plate 3).

A species of *Phoma* appears to be the agent of decay of young pods which "set" but do not develop. Whether the fungus (which belongs to a group of which some members are weak parasites) is the cause of the failure of the pods to develop has not yet been determined.

Spices.

(A). NUTMEG.

A disease characterized by the development of lesions on the pericarp of nutmeg fruits, followed by the splitting and falling of the fruit, occurred in Province Wellesley and Malacca. (Plate 2, Fig. 3.). The symptoms are typical of a disease



Figs. 5 & 6. Cacao Pods damaged by *Helopeltis* and Fungi.

well known in Java, caused by the fungus *Coryneum myristicae*, which is said to cause annual losses of about 50 per cent. of the crop in some districts. A fungus of the *Coryneum* type (conidia 49x5 microns) was associated with the disease in the localities mentioned above.

(B). CLOVE.

The fungus *Rhizoctonia bataticola* was associated with a root disease of clove trees growing on shallow soil in Penang.

Vegetables.

(A). POTATO AND TOMATO.

Blight (*Phytophthora infestans*) was again recorded on these crops at Cameron Highlands. In addition to attacking the foliage the fruits of the affected tomatoes were badly decayed by the fungus.

A number of varieties of potatoes indigenous to South America were planted this year at Tanah Rata. Some of them were attacked by *P. infestans* and later developed a storage rot of some of the tubers.

Potato cultivation at Cameron Highlands is rendered difficult on account of the susceptibility of the crop to blight and slime disease (*Bacterium solanacearum*). While it should be possible to control blight by spraying, coupled with planting the seed so that the main growth period occurs in the drier months, growing resistant varieties, and attempting to eradicate the "wild" potato plants which are now growing as weeds in many places, (and are a continual source of infection), the only practical method of combating slime disease is to grow resistant varieties. Unfortunately a number of the varieties resistant to this disease appear to be very susceptible to blight and *vice-versa*. Blight has recently appeared for the first time in Java and has caused considerable damage and, for a while, a shortage of seed potatoes. The shortage was aggravated by a destructive disease caused by *Colletotrichum atramentarium*, which appeared on imported seed potatoes. This disease has not yet occurred in Malaya.

(B). BEANS.

A leaf disease of minor importance was observed on beans in several holdings at Cameron Highlands. The causal fungus was *Cercospora cruenta*.

(C). COLOCASIA.

A case of leaf disease caused by *Phytophthora colocasiae* was received from Langkawi Island. This is the first record of the occurrence of this fungus on its eponymous host in Malaya.

Manila Hemp.

The mushroom *Marasmius semustus* attacked Manila hemp at Serdang and Johore. The fungus grows on the outer leaf sheaths of the pseudostem and, in damp weather, may cause the older leaves to wither prematurely. If these leaves dry up more rapidly than they are replaced by new growth the plants become stunted and, on poor soil, may be killed. *Poria Ravenalae* was recorded as a saprophyte on the leaves affected by *Marasmius*.

Tapioca.

A heavy mortality from root disease was reported from an area in Lower Perak where tapioca had been planted on heavy clay subject to waterlogging. The fungus responsible for the death of the plants was *Sphaerostilbe repens*.

Covers and Green Manures.

Rust (*Marasmius Crotalariae*) of crotalaria was very prevalent all over the country in 1937-1938, except at Cameron Highlands, where the fungus does not appear to occur. The fungus is responsible for appreciable damage to the foliage of *Crotalaria* spp., but the attacks are rarely fatal. Another rust fungus, which occurs on Tephrosia, has recently (1939) been identified by H. Sydow as *Ravenelia tephrosiicola* Hiratsuka.

Crotalaria was severely attacked by *Sclerotium Rolfsii* at the Pineapple Experiment Stations in Johore and Singapore. This soil fungus is difficult to control and is easily spread over an area if diseased plants are allowed to remain in the soil. A fungus incrusting the stems of *C. usaramocensis*, in a manner suggesting the presence of pink disease (*Corticium salmonicolor*), was identified as *Spicaria* sp. Most of the members of this genus are saprophytic or entomogenous.

Mikania scandens, growing as a cover on eroded banana land, was badly attacked by leaf spot caused by fungus *Cercospora*. Prolonged dry weather probably created conditions suitable for attack by this fungus.

Arecanut.

A curious form of stem rot occurred on a few palms in Province Wellesley. The green portions of the stems developed small black spots which gradually increased in size, and finally a black rot of inner stem tissue occurred and the palms died. The alga *Cephaleuros* was growing vigorously on the outside of the green stems and leaves, but the rot in the stem appeared to be caused by the fungus *Nigrospora sphaerica*.

Sireh (*Piper Bette*).

An outbreak of wilt occurred in Perak in 1937. Outbreaks in previous years, in Pahang, have been due to the fungus *Phytophthora colocasiae*, but on this occasion a species of *Pythium* (identified by the Imperial Mycological Institute as *P. splendens* var. *hawaiianum*) was responsible.

Flowering Plants.

Numerous specimens of diseased flowering plants were sent in for examination and report during the period under review. Among these the following were of interest:—

(1) *Bacterium solanacearum*—causing slime disease of zinnia, marigold, cleome, phlox, brinjal, chili and giant sunflower.

Carnation wilt (*Fusarium* sp. and *Pythium complectens*). Leaf spot (*Alternaria dianthi*).

Ornamental shrub (*Metrosideris amentosa*), leaf spot of youngest leaves caused by *Pestalozzia* sp.: gaillardia, wilt, *Pythium aphanidermatum*: verbena, leaf spot, *Rhizoctonia* sp.: canna, bacterial rot, (*Bacillus cannae*).

The fungus *Phoma* was prevalent during the dry weather in July to September on Rose of Sharon, quiscalis, Lagerstroemia and Peltophorum causing leaf spot.

Sclerotium Rolfsii occasionally wiped out whole beds of coreopsis in private gardens.

Newly imported varieties of roses were attacked at Cameron Highlands by rust (*Phragmidium subcorticium*). The disease first appeared on var. Mrs. G. A. van Rosem and later affected var. Mme. Butterfly and var. Aroma. Burgundy mixture was found beneficial in controlling this disease, which in 1924-25 wiped out the variety Maman Cochet at Maxwell Hill, Taiping.

Miscellaneous Records.

Tea, leaf disease, *Phaeosphaerella theae*.

Tea, thread blight, *Marasmius* sp.

Tea, decayed root, *Ganoderma resinosum*.

Japanese cherry (*Muntingia calabura*), heart rot and root disease, (undetermined Basidiomycete, probably *Fomes* sp.).

Tung Oil (*Aleurites montana*) from Burma, leaf disease associated with *Colletotrichum* sp. and *Acremoniella* sp.

Peach, rust of leaves, *Puccinia pruni-spinosae*.

Apple, leaf blotch, *Phyllosticta* sp. and *Phomopsis* sp.

Hevea, leaf disease, *Phyllosticta ramicola*.

Pepper, black rot, *Cephaleuros parasiticus*.

Pepper, leaf and fruit anthracnose, *Colletotrichum* sp.

Albizia moluccana, root and stem decay, Hydroid *Merulius* sp. and *Ganoderma applanatum*.

Cardamom, fruits, *Nigrospora sphaerica*.

Dahlia, leaf spot, *Cladosporium* sp.

Carpet grass, leaf rot, *Acrothecium* sp.

Ragi, root rot, *Sclerotium Rolfsii*.

Legislation Affecting Importation of Plants.

Consideration was given to the question of amending the Plant Importation Rules, S.S., to permit the importation of certain fresh fruits into the Colony by air.

The amendment came into force on October 7th, 1938, under the new title of "Plant Importation (amendment) Rules 1938," and, subject to inspection and special permit, permits the entry by air transport of fresh nectarines, peaches, pears, plums, strawberries, red and black currants, raspberries, and gooseberries. At present one firm is contemplating importing such fruits from Australia.

Received for publication 6th March, 1939.

RICE IN MALAYA IN 1938

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Prices.

The average wholesale prices of rice per picul in Singapore in 1938 were as follows:—Siam No. 2 ordinary \$4.26, Rangoon No. 1 \$3.74, Saigon No. 1 \$3.94, as compared with \$4.39, \$3.75 and \$3.92 respectively in 1937. Of the net imports during the year 61.5 per cent. were from Siam, 34.1 per cent. from Burma, 2.6 per cent. from French Indo-China and 1.8 per cent. from other countries. On this basis, the actual average price of rice consumed in this country during the year under review was \$4.17 per picul, as compared with \$4.08 per picul in 1937.

Retail prices were lower in 1938 than during the preceding year. The average retail prices for 1938 in cents per gantang of No. 2 Siam rice were as follows:—Singapore 28, Penang 32, Malacca 28, as compared with 30, 36, and 32 respectively in 1937.

It will be seen, therefore, that while both wholesale and retail prices of imported rice were lower in 1938 than in 1937, the average price paid by the consumer was greater in 1938 by reason of the fact that he purchased more of the expensive grades.

The main exporting countries in the East are Burma, Siam and French Indo-China, while exports from India continue to decline sharply and this country is now, on balance, an importing country. Reports from the exporting countries show favourable prospects for the new season crops, and there is, therefore, no reason to anticipate any shortage of supplies or any drastic upward price movements in 1939.

There was no change in the ocean freight rates to Malaya and no major changes in local railway rates for transport of rice.

The details of wholesale and retail prices are given in Table I.

Imports and Exports.

A statement of annual imports and exports, with values, for the past ten years is given in Table II, from which it will be seen that consumption of imported rice in 1938 increased by 7 per cent. and value of net imports by 6 per cent. Consumption of imported rice was the highest since 1930. Imported rice for local consumption during the year under review cost \$40,433,064, and reflects the statement given above that not only has total consumption increased, but in particular the consumption of the high-priced grades.

The net imports of rice in 1938 were 612,394 tons as compared with 573,063 tons in 1937. Of the 1938 net imports 376,635 tons were from Siam, 208,690 tons from Burma, 15,692 tons from French Indo-China and 11,377 tons from other countries, as compared with 289,283, 250,792, 23,623 and 9,365 tons respectively in 1937.

The different grades of rice products imported during 1938 were as follows (net imports only are given):—cargo rice 33,319 tons, parboiled 69,337 tons, white rice 430,494 tons, broken rice 79,244 tons, as compared with 26,328, 62,738, 424,870 and 59,127 tons respectively in 1937.

Table I
Average Prices of Rice in Malaya in 1938.

Month	Wholesale Prices of Rice Dollars per picul (133 1/3 lbs.)			Retail Prices of Rice Cents per gantang (gallon)			Price of Padi per Picul at Government Rice Mills, Perak
	Siam No. 2 (ordinary)	Rangoon No. 1	Saigon No. 1 (Long Grain)	Singapore	Penang	Malacca	
January ...	4.11	3.95	4.00	28	32	28	2.00
February ...	4.15	3.82	3.92	28	32	28	2.10
March ...	4.09	3.62	3.92	28	32	28	2.10
April ...	3.98	3.62	3.85	28	32	28	2.10
May ...	4.16	3.90	3.92	28	32	28	2.10
June ...	4.25	3.95	3.87	28	32	28	2.10
July ...	4.39	3.92	4.02	28	32	28	2.10
August ...	4.34	3.82	4.05	28	32	28	2.10
September ...	4.46	3.85	4.10	29	35	28	2.10
October ...	4.47	3.70	4.07	29	34	30	2.30
November ...	4.40	3.50	3.90	28	32	30	2.30
December ...	4.27	3.20	3.65	28	32	30	2.30
Average 1938	4.26	3.74	3.94	28	32	28	2.14
Average 1937	4.39	3.75	3.92	30	36	32	1.99
Average 1936	3.86	3.44	3.59	28	29	26	1.91

Table II
Rice: Malayan Imports and Exports.

Year	Imports		Exports		Net Imports	
	Tons	Value ₹	Tons	Value ₹	Tons	Value ₹
1929 ...	785,558	95,461,036	233,897	28,031,407	551,661	67,429,629
1930 ...	800,443	87,666,723	208,688	23,361,561	591,755	64,305,162
1931 ...	691,112	48,458,102	175,385	13,453,189	515,727	35,004,913
1932 ...	592,209	39,632,925	183,209	12,660,493	409,000	26,972,432
1933 ...	592,912	33,846,158	159,746	9,493,291	433,166	24,352,867
1934 ...	619,199	32,813,558	165,968	8,609,566	453,231	24,203,992
1935 ...	655,845	40,114,794	184,463	11,060,993	471,382	29,053,801
1936 ...	715,632	43,053,805	181,837	10,846,378	533,795	32,207,427
1937 ...	711,581	47,800,364	138,518	9,589,376	573,063	38,210,988
1938 ...	814,870	53,822,372	202,476	13,389,308	612,394	40,433,064

Note—The above table does not include figures for padi and rice bran, flour and meal.

The total quantity of rice products imported for local consumption in 1938, including bran, rice flour and rice meal of which 155,068 tons valued at \$5,019,269 were imported for consumption locally, amounted to 767,462 tons valued at \$45,452,333, as compared with 725,051 tons valued at \$43,310,804 in 1937. The net imports of padi, which amounted to 4,791 tons, valued at \$191,023, are not included in the above figures.

Areas and Yields in Malaya.*

The area planted with "wet" padi in the season 1937-38 was 682,120 acres, a decrease of 11,430 acres over the previous year's record figure of 693,550 acres. The Federated Malay States showed a decrease of 7,750 acres, the Straits Settlements 1,280 acres, and the Unfederated Malay States of 2,400 acres. This decrease is in part due to an unfavourable season, but the lower figure is also due to a very much closer estimate which it has been found possible to effect in some areas. In most districts it is considered that the estimates of area probably are within ± 5 per cent. of the true figure. Compared with 1936-37, the figures showing the largest decreases in area are Perak 3,000 acres, due partly to a more accurate estimate, Selangor 5,000 acres, due to the abandonment of one large unsuitable area and to more accurate estimate, Johore 2,000 acres and Perlis 2,000 acres, while an increased figure of 3,000 acres is shown in Kelantan due to the introduction of a new system of compilation.

Table III.
Areas and Yields of Padi.

Year	"Wet" Padi		"Dry" Padi				Total	
	Area Acres	Yield Gantangs	Area Acres	Gantangs Per Acre	Yield Gantangs	Gantangs Per Acre	Area Acres	Yield Gantangs
1929 - 30	629,650	103,624,000	164	27,550	3,160,000	114	657,200	106,784,000
1930 - 31	603,070	166,845,000	277	104,670	9,122,000	87	707,740	175,967,000
1931 - 32	635,130	184,631,000	291	89,850	12,472,000	139	724,980	197,103,000
1932 - 33	674,920	186,345,000	276	91,990	13,416,000	146	766,910	199,761,000
1933 - 34	691,110	215,098,000	311	74,140	9,389,000	127	765,250	224,487,000
1934 - 35	669,290	213,835,000	319	65,440	6,720,000	106	734,730	220,555,000
1935 - 36	674,900	219,786,000	325	50,150	8,087,000	161	725,050	227,873,000
1936 - 37	693,550	206,256,000	297	46,490	6,354,000	137	740,040	212,610,000
1937 - 38	682,120	193,240,000	283	44,550	6,020,000	135	726,670	199,260,000

(Acreage to nearest 10 acres: yields to nearest 1,000 gantangs)

* Estimating the area and yields of padi presents great difficulty, and the following figures are therefore given with due reservations.

Table IV.
Area of Land Planted in Malaya and Yield of Rice.

Season	F.M.S.		S.S.		U.M.S.		Total	
	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons	Area Acres	Production Rice Tons
1929 - 30	174,466	55,577	67,005	25,944	415,727	78,815	657,198	160,335
1930 - 31	178,930	57,027	67,350	39,503	461,460	167,672	707,740	264,202
1931 - 32	194,580	67,658	67,980	39,626	462,420	188,664	724,980	295,948
1932 - 33	214,160	76,331	70,530	36,051	482,220	187,539	766,910	299,921
1933 - 34	195,690	78,835	70,550	44,180	499,010	214,053	765,250	337,068
1934 - 35	176,750	79,559	68,500	43,988	489,480	207,617	734,730	331,164
1935 - 36	178,020	78,011	67,750	37,818	479,280	226,321	725,050	342,150
1936 - 37	185,730	80,872	69,090	37,622	485,220	200,740	740,040	319,234
1937 - 38	176,880	68,185	67,650	33,853	482,140	197,152	726,670	299,190

(Yield estimated on a basis of 666 gantangs of padi = 1 ton of rice)

The production of "wet" padi in the season 1937-38 was 193,240,000 gantangs, a decrease of 13,016,000 gantangs over the previous year. The cause of this lower figure is due in great measure to an attempt to institute a more thorough investigation into the methods of arriving at figures of yield. In some of the more important areas the method is to compare crop-cutting tests with estimates prepared by headmen; in other cases reliance is almost entirely on headmen's figures, while elsewhere closer official figures may be obtained by measurement of crops in the owners' stores and comparative crop-cutting tests.

But it is admitted that the best available method may give an error of ± 15 per cent., while in less accessible areas the error may be ± 50 per cent. The most, therefore, that can be said for these figures is that in the aggregate they are an approximation, and in view of the local knowledge of the compilers, they may provide a good index figure to compare the crop of one year with another.

It is an undoubted fact that the season under review was in most States less suitable for the crop than the previous season; the unsuitable season was mainly responsible for the decrease of 8,450,000 gantangs in the Federated Malay States, 2,510,000 gantangs in the Straits Settlements, and 2,390,000 gantangs in the Unfederated Malay States. The Perak figures alone account for about 6,000,000 gantangs of the total decrease.

"Dry" padi areas are unimportant. The area, as was expected, continues to decline, but the crop reaped in the past season was up to average.

Table V

**Area of Land planted in Malaya and Yields of Padi
Season 1937 — 1938.**

Territory.	Wet		Dry		Total	
	Acres	Gantangs	Acres	Gantangs	Acres	Gantangs
<i>F.M.S. :—</i>						
Perak ...	90,230	24,281,000	1,430	260,000	91,660	24,541,000
Selangor ...	14,970	3,572,000	180	46,000	15,150	3,618,000
N. Sembilan ...	33,630	9,683,000	40	6,000	33,670	9,689,000
Pahang ...	36,090	7,522,000	310	41,000	36,400	7,563,000
TOTAL ...	174,920	45,058,000	1,960	353,000	176,880	45,411,000
<i>S.S. :—</i>						
P. Wellesley ...	32,280	8,513,000	140	22,000	32,420	8,535,000
Penang ...	3,010	1,290,000	—	—	3,010	1,290,000
Malacca ...	31,510	12,605,000	—	—	31,510	12,605,000
Labuan ...	710	116,000	—	—	710	116,000
TOTAL ...	67,510	22,524,000	140	22,000	67,650	22,546,000
<i>U.M.S.* :—</i>						
Johore ...	6,080	754,000	180	19,000	6,260	773,000
Kedah ...	245,700	82,490,000	1,530	218,000	247,230	82,708,000
Perlis ...	39,610	10,174,000	—	—	39,610	10,174,000
Kelantan ...	115,990	26,531,000	30,510	4,358,000	146,500	30,889,000
Trengganu ...	32,310	5,709,000	10,230	1,050,000	42,540	6,759,000
TOTAL ...	439,690	125,658,000	42,450	5,645,000	482,140	131,303,000
TOTAL MALAYA ...	682,120	193,240,000	44,550	6,020,000	726,670	199,260,000

Note.—Acreage to the nearest 10 acres. Yield to the nearest 1,000 gantangs.

*Excluding Brunei for which figures are not available.

Table VI

**Malayan Production of Rice in Relation to Net Imports and
Consumption 1930—1938**

	1930	1931	1932	1933	1934	1935	1936	1937	1938
Net imports (tons)	591,755	515,727	409,000	433,166	453,229	474,955	533,795	573,063	612,394
Production (tons)	160,335	264,202	295,948	299,921	337,068	331,164	342,150	319,234	299,190
Consumption (tons)	752,090	779,929	704,948	733,087	790,297	806,119	875,945	892,297	911,584
Percentage of production to net imports	27	51	72	69	74	69	64	56	49
Percentage of production to consumption	21	34	42	41	43	41	39	36	33

Consumption Compared with Production and Imports.

Last year it was anticipated that Malaya would be able to show in 1938 a slightly more favourable balance between local production and total consumption, but the unexpected considerable increase in net imports of rice (the highest on record) and the somewhat disappointing figures of local production have resulted in a further decline in the percentage of production to consumption and the percentage of production to net imports. Malaya now produces approximately one-third of her rice requirements, while the huge bill for imported rice (\$40,433,064 in 1938) is the largest since 1930. (See Table VI).

Prospects for the 1938-39 Season.

The prospects of the 1938-39 rice crop were reviewed in the main areas of production at the end of 1938. It is anticipated that in most States the area under cultivation will at least be equal to that of the previous season while an appreciably increased planted area is reported from Kedah and Perlis. In Kedah the crop is expected to be about 10 per cent. greater than in the previous season, while a normal crop is anticipated in Perlis.

In Kelantan early rains were unevenly distributed and subsequent floods in some areas caused loss. In two Districts the prospects are reported to be fair to moderately good; in one District a heavier crop than usual is anticipated; in one District a 20 per cent. reduction in yield is expected, while in the remaining District the crop prospects are better than last year. The total crop from this large centre of production therefore holds a fair promise of a return not less than last year.

In Trengganu dry weather delayed planting, and subsequent floods occasioned damage to the crop. The "dry" padi promises well.

Province Wellesley and Penang reports are to the effect that while the present season cannot expect to excel the heavy crops reaped in Penang last year, the crop in the Province is generally considered to be better.

In the Krian area the crop should be satisfactory unless very unseasonable weather is experienced. The acreage is rather more than last year. In other parts of Perak prospects are promising.

Reports from Pahang state that difficulties have been experienced in the inland areas due to inadequate water supplies. On the coastal areas crops may be rather better than in the previous season. The report concludes by estimating that the total acreage in the State will not be less and perhaps may be more than in 1937-38 and a crop of 7 million gallons should be realized.

Summing up the general impression one obtains from these reports, it would appear that the area planted in Malaya in the current season is rather larger than last season, and that the crop harvested should be appreciably greater than in the 1937-38 season.

Milling.

There are two Government Rice Mills at Krian, Perak, and one at Temerloh, Pahang. The Krian mills purchased a total of 12,272 tons of padi during the year, and at Temerloh the purchase of 228 tons of padi constituted a record.

Many small power-driven rice mills have been erected in the main producing areas of the Peninsula. There are now thirty-seven such mills in Kedah as compared with sixteen at the end of the previous year. Ten similar mills were in operation in Perak, with a further six in course of erection or contemplated.

In Province Wellesley, also, in addition to the old established large mills, seven small mills have now come into operation with a further four under construction. In Kelantan, the Tumpat mill was able to purchase considerably more local padi than in the previous year.

A Malay Rice Millers' Association has been formed in Province Wellesley, the principal objects being to prevent unnecessary competition and to exchange information on the marketing of milled products.

Acknowledgments.

The Field Branch of the Department of Agriculture, in collaboration with the Land Officers, is responsible for the estimates of areas and yields summarized in Table V. The figures for imports and exports and relative values are obtained from Malayan Statistics, published by the Statistics Department, S.S. and F.M.S.

Abstracts.

THE POSITION OF COFFEE ON THE WORLD MARKETS.*

Production and Consumption.

World production of coffee in the season 1937-38 (1 July to 30 June) was 5,474 million lbs. as compared with 5,661 million lbs. in 1936-37. Brazil was the most important producer with 3,412 million lbs., followed by Colombia 569 million lbs. and other South American countries contributing 738 million lbs. Non-American countries produced 564 million lbs., the chief country of production being the Netherlands Indies with 264 million lbs. Other countries of production are India, Ethiopia, Tanganyika, Kenya, Angola, Madagascar and Belgian Congo, together producing 300 million lbs.

The volume of world net imports of coffee, which in 1935 and 1936 showed an appreciable recovery over the preceding years, fell slightly in 1937 to 3,476 million lbs., but still exceeded by about 215 million lbs. the 1927-31 average. The net quantity of coffee absorbed in 1937 by Europe reached the very high figure of 1,521 million lbs., an increase of about 40 millions on the previous year and 57 millions on the 1927-31 average. On the other hand, the net imports into the United States of America in 1937, which amounted to 1,690 million lbs., show a decrease practically equal to the increase of imports into Europe, so that the total volume of imports in 1937 in Europe and the United States—which together absorb more than 90 per cent. of world imports—remained almost without variation from those of 1936. Consequently, the slight decrease in net world imports in 1937 over the preceding year is due almost entirely to other countries, whose consumption of coffee is very small.

Position of Brazil in the Coffee Market.

International trade in coffee is dominated by the new monetary and commercial policy adopted by Brazil in November 1937.

The part played by Brazil in world supplies, with the very marked annual oscillation of the last 10 years and despite the increase in world net imports, has undergone a very appreciable recession, falling on the average from 71.4 per cent. to 62 per cent. between 1909-13 and 1927-31. In more recent years the maximum was attained in 1933 with 62.3 per cent. and minimum in 1937 with 47.1 per cent.

On the other hand, the contribution of "milds" shows a very marked gradual increase, which has not only balanced the relative decrease in Brazilian exports, but has in a large measure satisfied the increased world requirements. It follows that the increase in world requirements has benefited especially the countries produc-

* Abstract of an article entitled World Statistical Position of Coffee, by A. di Fulvis published by the International Institute of Agriculture, Rome, in *Monthly Crop Report and Agricultural Statistics*, May, 1938.

ing "milds."* The rôle of Brazil in world supply, also in consequence of her valorization policy, has been reduced to that of supplying the difference between world coffee consumption and total production in other coffee-growing countries which have been able to move their annual crops in a normal fashion.

Measures Designed to Regulate the Market.

In the expectation of an abundant Brazilian crop in 1937-38, the producing states in that country, under the auspices of the Departamento Nacional do Cafe, in 1937 adopted a series of resolutions for the prevention of any further deterioration in the situation of the national and world coffee markets. Among the resolutions the Departamento Nacional do Cafe was to acquire 70 per cent. of the total crop at fixed prices, the remaining 30 per cent. to form the part delivered to the free market according to conditions laid down by shipping companies. In the season 1936-37, 41.4 per cent. of the production was destroyed, while in the following season there was an intensification of the policy of coffee destruction. From the middle of 1931 to the end of March 1938, of an aggregate production in Brazil of 23,209 million lbs., 7,902 million lbs. were destroyed.

In consequence of this regulated destruction, the volume of stocks was reduced by more than 55 per cent. from 2,454 million lbs. at the end of 1936 to 1,112 million lbs. at the end of 1937. The greater part of the stocks is held in the interior of the country, for arrivals of coffee at ports of shipment are regulated so that available stocks are maintained, distributed at different ports, at 327 million lbs.

On the international plane, the dominating factor in coffee policy at the beginning of the 1937-38 season was the Second Pan-American Coffee Conference at Habana, of which the object was to bring about a complete agreement between the principal American coffee-producing countries with a view to sustaining the international market. The work of this and the preceding Conference and the efforts subsequently made by the Pan-American Coffee Office at New York have had no concrete results and the world coffee market has had to face a new situation. Brazil has abandoned her valorization policy and has resolutely taken the road of free competition and the coffee-producing countries have entered on a price war.

Conclusions.

The situation of the world coffee market in consequence of the price war has become more precarious. It is not possible to foresee exactly future developments, which involve the vital interests of a large number of producing countries whose

* According to W. H. Ukers, in his book "All About Coffee", there are two general classifications of coffee, "Brazils" and "Milds". A little more than two-thirds of the world's supply comes from Brazil, while the "milds", produced in other countries, make up the other third. Among the mild coffees there is much greater variation in characteristics than is found among the Brazilian growths. Mild coffees generally have more body, more acidity, and a much finer aroma than Brazils; and from the standpoint of quality they are far more desirable in the cup. "Milds" are important for blending purposes, most of them possessing distinctive individual characteristics, which increase their value as blending coffees.—*Ed., M.A.J.*

economy is intimately linked with this crop. There is no doubt that the statistical position of the product has improved in recent years in consequence of the drastic measures adopted by Brazil. The problem of coffee, however, as far as the two closely interdependent factors of production and consumption are concerned, has not yet been solved, for the annual production of Brazil alone is sufficient at present to meet almost the entire world demand. It is thus necessary to envisage and realize an all-round agreement between the coffee countries, notably as regards production and distribution of the product in these countries and the elimination, or reduction to a minimum, by means of an international agreement, of the obstacles, of which the principal is customs duties, that limit the world consumption of the product.

WHALE OIL PRODUCTION.

According to the latest issue of *Vegetable Oils and Oilseeds** the number of whales killed in the Antarctic in the 1937-38 season was 44,000, producing 541,000 tons of oil. These figures showed an increase of 10,000 whales and 98,000 tons over the previous season. The output of whale oil, the most important of the marine fatty oils, now competes very seriously with the vegetable oils, particularly in northern Europe. In 1937 whale oil constituted 25 per cent. of all oils and fats used in the margarine, compound lard and soap industries in the United Kingdom, and in 1935 it represented 50 per cent. of the oils and fats used by the margarine and edible fat industry in Germany. Norway and the United Kingdom are still the principal countries concerned in the production of whale oil, but Germany and Japan, in particular, have recently taken a larger part.

From 1930 to 1937 an average of 92 per cent. of the world supply of whale oil was obtained from the Antarctic whaling grounds, where the bulk of the oil is extracted on board floating factories moving along the edge of the icefields. Total output increased rapidly till it reached the record of 614,000 tons in 1931, when a very large quantity remained unsold. The great expansion of the industry in the Antarctic had by that time overshadowed whaling in other parts of the world, where the whaling stocks had been depleted by intensive fishing and modern methods of hunting. In 1932 the whole Norwegian fleet was laid up and world production was reduced by 75 per cent., thus giving an opportunity for accumulated stocks to be absorbed. In the two subsequent seasons production in the Antarctic, which was limited by agreement, was steady at about 400,000 tons each season, although production elsewhere tended to rise. In the next two seasons the Antarctic production increased substantially, reaching 541,000 tons in 1937-38.

* *Vegetable Oils and Oilseeds*. Printed and Published for the Imperial Economic Committee by H. M. Stationery Office, November 1938. 116 pp. Price 2s. 9d. post free. The previous issue of this publication was reviewed in *The Malayan Agricultural Journal*, Vol. XXVI, No. 4, April 1938.

In 1937, an International Agreement was signed by nine countries which had for its object the maintenance of the stock of whales by limiting the whaling season, forbidding the killing of certain kinds and closing certain areas of the Atlantic, Pacific and Indian Oceans.

At a second Conference in London in June 1938 certain modifications and extensions were decided upon. These were embodied in a Protocol signed by ten countries, the Final Act of the Conference being in addition signed by two other countries, including Japan, which country, however, signed with certain reservations.

World production of whale oil in 1937 was 535,000 tons.* The provisional figures for export of oilseeds and vegetable oils from the producing countries in 1937 were: oilseeds approximately 10,000,000 tons, and vegetable oils 1,100,000 tons. Chief amongst the former were soya beans, linseed and groundnuts, each of which had a production slightly over 2,000,000 tons, copra 1,500,000 tons, palm kernels 750,000 tons, and cottonseed 835,000 tons. Of vegetable oils palm oil ranked first with a production of 495,000 tons, coconut oil 296,000 tons and tung oil 101,000 tons.

* In 1938 it appears probable that the total production will be about 650,000 tons. *Ed. M.A.J.*

Reviews.

Examination of some Tinned Foods of Historic Interest.

Publication No. 85 of the International Tin Research and Development Council.

Reprinted from "Chemistry and Industry" 1938.

New light on the origin and early products of the canning industry is made available in this publication. The report is a reprint of papers recently read before the Food Group of the Society of Chemical Industry by Professor J. C. Drummond and others.

The papers describe how a number of tins of meats and vegetables which had reposed in the Royal United Services Museum and the National Maritime Museum, London, were opened and submitted to chemical and bacteriological analysis. Two of the tins, one containing veal and the other carrots, had accompanied Sir Edward Parry, the Arctic Explorer, on his famous expeditions in search of the North-West Passage in 1824, and when opened they proved to be still in "what one could fairly call perfect condition." The reports of the various analyses are given in detail with photographs of the actual cans. The first part of the booklet recounts briefly the discovery of the principles of the canning process by Nicholas Appert in France and their adaptation by a celebrated English engineer and Vice-President of the Royal Society, Bryan Donkin, so that robust canisters of tinplate could be used instead of Appert's fragile glass jars. So successful was Donkin that within seven years his tinned foods factory at Bermondsey, the first in the world, was supplying tens of thousands of large tins to the Navy for Australian and Arctic expeditions and later as "medical comforts" for crews of ships on ordinary voyages.

There are some interesting sidelights on the theories advanced at the time for the success of the canning process and also a report upon some dried vegetables in tins which were packed for the army during the Crimean War.

Copies of the above publication may be obtained free of charge by application to the Secretary of the International Tin Research and Development Council, Fraser Road, Greenford, Middlesex.

International Bibliography of Agricultural Economics.

Quarterly publication. Rome. Annual subscription 6s. 6d. post free.

The International Institute of Agriculture in Rome has commenced quarterly publication of a bibliography dealing with agricultural economics in all its various phases. This bibliography, which is based on the material received by the Library of the Institute, is compiled under the technical direction of the Librarian, Dr. S. von Frauendorfer.

The International Bibliography of Agricultural Economics covers the economic and social aspects of agriculture, such as agricultural economics, agricultural policy, settlement, credit, co-operation, insurance, marketing, prices, statistics, farm organization and management, valuation, labour, accounting, rural sociology, agricultural history and geography, legislation and education and all other agricultural problems, in so far as they are considered from the economic and social point of view. Only publications of purely technical character are excluded. Titles of all publications, whether books, bulletins, pamphlets or articles in periodicals, are indicated, including all bibliographical details required for proper identification. All languages receive equal treatment and titles in the less known languages are provided with a translation.

The bibliography, which is the only one which covers systematically the world literature on agricultural economics, is carefully classified by subjects. An author-index will be supplied at the end of each volume.

The Planters Gazette and Annual.

Vol. 1, No. 1. Published by the Planters Gazette and Annual, 9, Royal Street, Calcutta. Subscription Rs. 6 per annum.

The first number of this journal deals with various aspects of agriculture in India. Pride of place is given to the tea industry on which crop there are no less than fourteen articles. The Journal, however, covers a wide range of interests and includes informative original articles on coffee, cattle, tobacco, wheat, rice, cotton, timber, sugar and jute, and in addition information on such subjects as agricultural economics, health, trade and labour.

The Planters Gazette claims to present a true picture of the varied agricultural and planting activities in India. The first number sets a high standard of both literature and production, and should prove of value to agriculturists in other tropical countries. We wish success to this addition to the list of journals dealing with tropical agriculture.

Departmental. FROM THE DISTRICTS.

*Compiled by the Chief Field Officer from Monthly Reports
of Agricultural Officers.*

February, 1939.

The Weather.

In the west coast areas wet weather continued during the first week in February; thereafter conditions were hot and dry. In North Kedah the dry weather commenced rather earlier, and hot dry northerly winds prevailed which tended to intensify the drought.

In Pahang light but regular falls of rain occurred and the total precipitation approximated to the average.

Conditions in Kelantan were extremely dry; the highest rainfall for the month occurred at Pasir Puteh (1.42 inches) and the lowest at Tumpat (0.0 inches). The rainfall figures for January at these two recording stations were 58.14 inches and 30.62 inches respectively.

The weather in North Johore was particularly dry and total precipitation was well below the average for February. In other parts of the State dry weather was also experienced, but showers occurred frequently.

Crop Reports.

Rubber.—Rubber trees are now wintering; as the crop obtainable is always less during this period, tapping on small holdings and estates will undoubtedly be curtailed.

The Asiatic Rubber Instructors in Kelantan report that the production of lump rubber has now been eliminated in all districts. This satisfactory state of affairs is the result of two years of intensive demonstration and propaganda, which have been aided considerably by market conditions. At present dealers pay an extra 50 cents per picul for sheet known to be acid coagulated, up to \$2 extra per picul for clean and well prepared smoked sheet, and up to \$4 extra for prime smoked sheet. The Department has given small rubber growers assistance in marketing their product and also loans for the purchase of equipment for sheet manufacture.

Most of the smoke houses now being constructed in this State are of a medium size and are not the small cabinet type. They are usually built co-operatively and the owners smoke and sell their rubber collectively, grading it, if necessary, before sale. In other parts of the country there appear to be few of the small smoke cabinets now working, and considering the good price at present being paid by dealers for unsmoked sheet, this is only to be expected. The present ready market for unsmoked sheet is further exemplified by the practice of certain Pahang dealers who have ceased to smoke the sheet they purchase, and now send it straight to

Kuala Lumpur where the large dealers smoke it. Under present circumstances officers of the Department and Asiatic Rubber Instructors have had to content themselves with advocating the manufacture of clean sheet.

During the recent tour of the Rural Lecture Caravan in Perak at each stopping place the opportunity was taken of explaining to the audience the new rules relating to planting and replanting under Rubber Regulation. In the more rural districts many small-holders were entirely ignorant or quite incredulous of these rules.

Padi.—In North Kedah the harvest is now almost complete, and in the Central and South Districts is well in hand. After receiving reports on the areas so far reaped, considerable optimism is felt locally as to the total crop likely to be harvested and it is expected to exceed last year's by a considerable amount.

During the last month the weather has been dry and conditions perfect for harvesting.

In Province Wellesley it is reported that unemployed rubber tappers have entered the padi growing areas in large numbers to take part in the harvest. Harvesters customarily receive as payment 20 gantangs of padi in every 100 gantangs that they reap.

Government rice mills in Perak are continuing to pay a premium of 10 cents per picul on sealed bags of Seraup 48 of the new season's crop.

Over the greater part of Pahang the harvest is now completed. The rice mill at Temerloh has been buying larger quantities of padi than in previous seasons. A total of 910 piculs was bought during the month at a price of \$2 to \$2.20 per picul. Although weather conditions during part of the season were very unfavourable, the crop harvested has been better than had been expected and some reports state the yields to be greater than those of the season before.

Livestock.

During the past year 10,500 cattle and buffaloes have been slaughtered for consumption in Kelantan. This is the first time that these figures of local consumption have been collected and the total is unexpectedly high. In addition 1,000 head of cattle were exported. There has lately been an increase in activity in the export trade. This trade is potentially a valuable one, but in the past it has been hampered by restrictions. These have been eased to some extent since the new Cattle Enactment came into force.

The Farm Schools.

The new term at the Malacca Farm School will begin during March. Forty-two applications for entry were received, but of these applicants only 33 were allowed to sit for the entrance examination, as past experience has shown the wisdom of admitting only boys who come from rural areas. Hence applicants from the town area were refused permission to sit for the examination. As a result of the examination twenty-five of the boys were selected; of these the first ten will receive free tuition.

Applications are now also being received for the next term at the Penang Farm School.

DEPARTMENTAL NOTES.

Appointment.

Mr. R. G. H. Wilshaw, Chemist, Malayan Agricultural Service, has been appointed to the post of Senior Chemist (Soils) with effect from 15th June, 1938, inclusive.

School of Agriculture Poultry Housing Methods in Siam.

The Department of Agriculture and Fisheries, Siam, exhibited three of the Malayan School of Agriculture Portable Night Arks and Day Shelters in the Poultry Section of the Constitutional Fair held at Bangkok from 8th to 14th December 1938. It is reported that these exhibits attracted considerable attention and were all sold to poultry enthusiasts at the close of the Fair.

Two night arks are also in use at the South Siam Agricultural Experiment Station, Haadyai, Siam, and the Chief of this Station states that he intends to increase the number.

Poultry Leaflet No. 2 describes the construction and use of the School of Agriculture Night Ark and Day Shelter, and can be obtained on application to the Principal, School of Agriculture, Malaya, P.O. Sungei Besi, Selangor, F.M.S.

Distribution of Material from Agricultural Stations.

Monthly reports of Agricultural Officers supply evidence of the growing importance of Agricultural Stations in supplying improved planting material, poultry, and eggs for hatching.

The list of planting material supplied during February, for instance, is too long and varied for details to be given in this place. In addition to quantities of seed of various vegetables, fruits and padi, distributions included 112 fruit plants, either seedlings or budded plants, 47 bags of grasses and cover crops, and 212 lbs. of seed of various cover crops. Fowls and chicks for breeding numbered 85, and fowls' eggs for hatching 67. Fungicides for treating rubber diseases are sold in certain centres, and over 100 gallons was disposed of in February.

Visit to British North Borneo.

Arrangements have been made for the Agricultural Officer, Brunei, to visit the Jesselton district of British North Borneo in order to purchase buffaloes to be shipped to Brunei for supply to padi cultivators.

Leave.

Mr. H. L. Barnett, Assistant to Agricultural Economist, returned from leave on 10th February, 1939.

Mr. H. K. Ashby, Agricultural Officer, returned from leave on 23rd February, 1939.

Mr. R. G. H. Wilshaw, Senior Chemist (Soils), returned from leave on 24th February, 1939.

FERTILIZER PRICES, FEBRUARY, 1939.

The following are the prices at the end of February, 1939, of some of the more important fertilizers.

more important returns.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	80.00
Muriate of Potash	...	—	—	50	112.00
Sulphate of Potash	...	—	—	48	112.00
Superphosphate (concentrated)	...	—	39	—	105.00
Superphosphate	...	—	—	—	60.00
Basic Slag	...	—	16	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	40.00
Lime	...	—	—	—	20.00

* Citric soluble.

‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical.

MARKET PRICES.

February, 1939.

Major Crops.

Rubber.—Following the decision of the International Rubber Regulation Committee to make no alteration in the quota release for the second quarter the Singapore price of rubber rose steadily after an initial rise and fall in the first half of the month. No. 1 X. Rubber Shoked Sheet, loose, opened in Singapore at 26 $\frac{3}{4}$ cents per lb. and closed at 28 $\frac{1}{2}$ cents, after reaching 28 $\frac{5}{8}$ cents on the 27th. The average of daily quotations was 27.24 cents per lb. as compared with 27.26 cents in January. The London average quotation per lb. was 7.96d. and New York 15.85 cents gold, as compared with 7.96d. and 15.72 cents gold in January.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, February, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak		Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.			
	15	22	2	9	16	1	8	15	22
Smoked Sheet	33.00	34.18	32.00	33.00	34.25	—	—	32.48	—
Unsmoked Sheet	—	—	31.00	32.00	—	30.68	31.02	31.94	32.48
Scrap	No purchases								

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent
No purchases of rubber at Kuala Kangsar on 1st and 8th and at Kuala Pilah on the 23rd February.

Palm Oil.—Prices improved slightly during the month as shewn in Table II. January averages of weekly quotations were:—palm oil £13.0.0, kernels £8.11.3 per ton.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
February 3	£ 13. 0. 0 Liverpool	£ 8. 10. 0 Continent
" 10	13. 0. 0 "	8. 12. 6 "
" 17	13. 5. 0 Canada	8. 12. 6 Rotterdam
" 24	13. 10. 0 Liverpool	8. 17. 6 Hamburg
Average	£ 13. 3. 9	£ 8. 13. 2

Copra.—There was a distinct improvement in this market during February and prices rose steadily from \$3.35 to \$3.80 per picul for the sun-dried grade. The average Singapore price for this grade was \$3.53 per picul, and for the mixed grade \$3.23, as compared with \$3.30 and \$3 in January.

The price of copra cake remained unchanged at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in January were as follows: Siam No. 2 Ordinary \$4.22, Rangoon No. 1 \$2.92, Saigon No. 1 \$3.30, as compared with \$4.27, \$3.20 and \$3.65 in December and with \$4.11, \$3.95 and \$4 in January 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were: Singapore 27, Penang 32, Malacca 30, as compared with 28, 32 and 30 in December.

The average declared trade value of imports during January was \$3.78 per picul, as compared with \$3.85 in December and \$3.85 in November and \$4.04 in January, 1938.

Padi.—In Perak South padi prices per 100 gantangs (gallons) ranged from \$5.50 to \$13; in Perak Central the price was \$8.50, and in Perak North \$12. The price in Pahang was \$7 to \$12, and in Selangor from \$8 to \$12. Kedah and Province Wellesley were \$7, Kelantan \$8.70, and Negri Sembilan \$6.50 to \$10.

The Government Rice Mills, Krian, Perak, paid \$2 per picul for padi, and the Government Rice Mill, Temerloh, Pahang, \$2 to \$2.20. The Kedah mills paid from \$1.80 to \$1.85 per picul.

Pineapples.—Singapore prices of canned pineapples, per case of 48 cans of 1½ lbs. each, were as follows:—G.A.Q. Spiral \$3, Round \$4, Cube \$3; Golden \$3.40, \$4.30 and \$3.45 respectively. The month's harvest was very small, and practically all the present season's pack has been sold.

Fresh fruit prices in Singapore were \$1 to \$1.80 per 100, and in Johore \$1.30 to \$1.60 for 1st quality, \$1 to \$1.20 for 2nd quality, and 60 to 90 cents for 3rd quality.

Beverages.

Tea.—Two consignments of Malayan lowland tea, comprising 140 packages, were sold on the London market in February at 11½d. and 1s.0d. per lb., the average price being 11.63d. per lb. One consignment of 102 packages from Cameron Highlands was sold in London at 1s.3d. per lb.

According to the *Tea Market Reports* for February of the Tea Brokers' Association of London, the average London prices per lb. realized for tea from other countries were as follows:—Ceylon 1s.3.07d., Java 1s.0.09d., Indian Northern 1s.1.16d., Indian Southern 1s.1.80d., Sumatra 10.83d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 28th February 1939 of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 87, Medium Grown Teas 74, Low Grown Teas 66.

Coffee.—Liberian coffee was quoted at \$14.75 per picul throughout the month but weakened to close at \$14.50. Excelsa and Robusta were quoted at \$10.25 and \$6.50 respectively throughout the month.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$9.87 to \$10.87, and for Sourabaya coffee \$11.50 to \$12.62, the price within these ranges depending upon quality.

Spices.

Arecanuts.—The averages of Singapore Chamber of Commerce quotations per picul were: Best \$7.35, Medium \$6.81, Mixed \$6.31.

The averages of highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.50 to \$7.60; Red Whole \$6.20 to \$9.37; Sliced \$9 to \$11.75; as compared with \$10.06 to \$7.81, \$7.75 to \$5.75, and \$6.12 to \$4.37 respectively in January.

Pepper.—Prices continued to show an upward trend with the exception of Singapore Black which fell back slightly in the second half of the month. Average prices per picul in Singapore were as follows:—Singapore Black \$8.62, Singapore White \$13.19, Muntok White \$13.44, as compared with \$8.50, \$12.37 and \$12.62 respectively in January.

Nutmegs.—The Singapore price of both 110's and 80's improved to \$30, averaging \$29.50 for the month as compared with \$28 in January. Penang dried nutmegs were sold at \$20 per picul.

Mace.—The nominal quotations for Siouw in Singapore rose to \$85 per picul averaging \$82.50 for the month. Amboina continued unchanged at \$60 per picul. In Penang, locally produced mace, dry, was sold for \$75 per picul.

Cloves.—Nominal quotations in Singapore for both Zanzibar and Amboina remained unchanged at \$40 per picul. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in the *The Ceylon Chamber of Commerce Weekly Report* for 27th February, 1939, from Rs. 1.10 to Rs. 1.21 per lb.

Miscellaneous.

Derris.—The average prices in Singapore for root sold on a basis of ether extract remained unchanged at \$8 to \$10 per picul, but root sold on rotenone content improved slightly to average \$18 to \$20 per picul as compared with \$17 to \$19 in January. The demand shows some improvement, but little business is passing as growers are holding out for higher prices.

Our New York correspondent reports on January 18 that the market shows little change, 5 to 6 per cent. elliptica root being offered at 5½d. per lb. c.i.f. New York, 8 per cent. root at 7½d., and 17 per cent. malaccensis at about 4d. per lb.

Cubé root, on the other hand, has not come down perceptibly from prices current last season, and the competition between derris and cubé products for the coming season is now keen. There is now very little difference between the selling price of derris powder and licensed cubé powder, and there is no longer any doubt that considerably larger quantities of derris root will be used by the United States market this year than in 1938.

Gambier.—Prices in Singapore continued unchanged: Cube No. 1 \$15 per picul; Block at \$7 nominal per picul.

Sago.—Pearl depreciated by 5 cents per picul in Singapore to average \$3.71 per picul as compared with \$3.75 in January. Flour, Sarawak Fair, improved 5 cents, averaging \$2.24 per picul as compared with \$2.19 in January.

Tapioca.—Seed Pearl and Pearl Medium continued unchanged at \$3.90 and \$4.50 per picul respectively, but Flake Fair weakened 5 cents at the close to average \$3.89 per picul.

Tobacco.—Kelantan prices of locally grown tobacco remained high, 1st grade \$100 to \$160 per picul, 2nd grade \$75 to \$128, 3rd grade \$50 to \$112. In Kedah the range was \$38, \$26 and \$20, and in Province Wellesley and Penang \$40, \$33 and \$22. Negri Sembilan prices were \$15 to \$48, \$13 to \$45, and \$10 to \$40. In Perak South the three grades were \$22 to \$27, \$14 to \$21, \$9 to \$18, and in Perak Central \$25.50, \$17.50 and \$8.75. In Johore North dried leaf ranged from \$3 to \$15 per picul, and prepared tobacco from \$20 to \$60, while in Johore Central dried leaf reached \$42, and prepared tobacco \$128 per picul.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

January, 1939.

Malaya.—The imports of foreign rice during January were 72,094 tons,† and exports 19,446 tons, net imports being 52,648 tons as compared with 43,183 tons in 1938.¶

Of the January imports 49 per cent. were consigned to Singapore, 18 per cent. to Penang, 7 per cent. to Malacca, 21 per cent. to the Federated Malay States and 5 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 48,915 (67.8), Burma 18,099 (25.1), French Indo-China 3,819 (5.3), other countries 1,261 (1.8).

Of the exports during January 70 per cent. were consigned to the Netherlands Indies, and 30 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 14,152 (72.8), Burma 4,052 (20.8), French Indo-China 444 (2.3), parboiled 751 (3.9), Malayan production 47 (0.2).

January net imports, by countries of origin, were (in tons, percentages in brackets):—Siam 34,763 (62.8), Burma 14,047 (33.0), French Indo-China 3,375 (2.4), other countries 463 (1.8).

India.—Foreign exports during 1938 totalled 260,000 tons as compared with 690,000 tons in 1937, a decrease of 62.3 per cent. Of these exports 1.9 (3.7) per cent. were to the United Kingdom, 3.1 (5.5) per cent. to the Continent of Europe, 38.8 (29.3) per cent. to Ceylon, 5.0 (20.9) per cent. to the Straits Settlements and the Far East, and 51.2 (40.6) cent. to other countries. The figures in brackets are for the corresponding period of 1937.

Burma.—Foreign exports from the 1st to 25th January were 227,339 tons, as compared with 186,320 tons in 1938, an increase of 22.0 per cent. Of these exports 61.4 (46.5) per cent. were to India, 7.9 (11.6) per cent. to the United Kingdom, 0.5 (nil) per cent. to the Continent of Europe, 15.4 (20.4) per cent. to Ceylon, 11.0 (16.1) per cent. to the Straits Settlements and the Far East, and 3.8 (5.4) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average January prices in rupees per 100 baskets of 75 lbs. each in Rangoon were:—Big Mills Specials 187, Small Mills Specials 190.

According to the fourth forecast of the rice crop in Burma for the year 1938-39, the area likely to mature is estimated at 12,584,000 acres, a decrease of 55,300 acres since the issue of the third forecast, and 6,900 acres less than the area actually matured last year.

* Abridged from the Rice Summary for January 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937 or 1938.

The district reports now indicate that this year's crop will yield about 8,225,400 tons of padi as against 6,918,800 tons estimated at this time last year. The exportable surplus of the 1938-39 crop is now estimated at 3,600,000 tons of rice and rice products which may be taken as the equivalent of 4,865,000 tons of padi.

Siam.—November 1938 exports of rice and rice products from Bangkok were 107,254 tons, with a total for the eleven months of 1,354,908 tons as compared with 850,448 tons in 1937.

The following is a summary of crop conditions at the end of December 1938. The area cultivated totalled 7,780,662 acres, an increase since the last report of 247,895 acres. The damaged area is now estimated to be 759,055 acres, an increase of 65,657 acres, and 9.8 per cent. of the area planted. The total harvested area was approximately 2,803,084 acres, with a yield of 1,725,265 tons of padi.

Japan.—The actual rice crops of Japan for the year 1938 amounted to 9,238,302 tons, a decrease of 0.6 per cent. as compared with the actual crops of the previous year.

French Indo-China.—Entries of padi into Cholon during January were 174,418 tons, as compared with 122,060 tons in 1938, an increase of 42.9 per cent. January exports of rice were 92,714 tons as compared with 87,962 tons in 1938, an increase of 5.4 per cent.

The general tendency of prices of rice and padi in December was downwards.

Netherlands Indies.—The area harvested in Java and Madoera during January to September 1938 amounted to 9,003,150 acres, an increase of 1.8 per cent. over 1937.

Imports of rice into Java and Madoera during the same period totalled 21,992 tons, as compared with 1,493 tons in 1937, an increase of 1,373 per cent., and into the Outer Provinces 215,819 tons as compared with 88,714 tons, an increase of 143.8 per cent.

Ceylon.—January imports were 47,466 tons as compared with 39,974 tons in 1938, an increase of 18.7 per cent. Of these imports 14.0 (12.6) per cent. were from British India, 65.7 (76.9) per cent. from Burma, 1.4 (1.9) per cent. from the Straits Settlements, and 18.9 (8.6) per cent. from other countries. The percentages in brackets are for the corresponding period of 1938.

Europe and America.—Shipments from the East to Europe from 1st January to 29th December 1938 totalled 1,169,756 tons, an increase of 2.7 per cent. as compared with 1,138,781 tons in 1937. Of these shipments 39.3 (37.9) per cent. were from Burma, 47.7 (56.2) per cent. from Saigon, 11.9 (4.4) per cent. from Siam, and 1.1 (1.5) per cent. from Bengal. The 1937 percentages are in brackets.

Shipments for the Levant during 1938 totalled 29,645 tons as compared with 16,289 tons in 1937, an increase of 82 per cent. Shipments for Cuba, West Indies and America from 1st January to 23rd December aggregated 179,778 tons as compared with 227,717 tons in 1937, a decrease of 21.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, DECEMBER, 1938.

PRODUCT.	Net Exports in Tons			
	Year 1937	Year 1938	December 1937	December 1938
Arecanuts ...	30,084	33,769	3,078	2,370
Coconuts fresh ...	95,223†	116,743†	8,569†	14,924†
Coconut oil ...	39,762	49,140	3,660	5,108
Copra ...	75,592	68,754	9,647	4,164
Gambier, all kinds ...	1,955	1,632	76	113
Copra cake ...	15,026§	7,112	734§	626
Palm kernels ...	7,312	9,359	495	939
Palm oil ...	42,787	54,377	3,236	4,511
Pineapples, canned ...	80,502	73,168	5,103	4,500
Rubber ...	503,127¶	360,898¶	50,212¶	25,240¶
Sago,—flour ...	15,478	4,537	2,002	695
„ —pearl ...	3,759	4,203	253	250
„ —raw ...	8,256*	5,088*	673*	263*
Tapioca,—flake ...	1,058	981	51	84
„ —flour ...	2,393*	3,072*	288*	229*
„ —pearl ...	18,786	17,818	1,682	1,324
Tuba root ...	573	676	21	68

† hundreds in number.

* net imports.

¶ production.

§ gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1939	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,402.5	3,385.0	429.7	502.0
January 1938	2,241.7	1,809.2	383.7	232.0
Total for the year 1938 ...	28,979.0	22,087.7	5,158.9	3,620.0

Stocks on estates as at 31st January, 1939, were: palm oil 3,191 tons, palm kernels 670 tons.

METEOROLOGICAL SUMMARY, MALAYA, JANUARY, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL							BRIGHT SUNSHINE.			
	Means of		Absolute Extremes				At 1 foot	At 4 feet	Total.		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.
	A.	B.	Min.	Max.	Lowest	Highest						Precipitation .01 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	Max.	Min.	°F	°F	°F	°F	°F	°F	in.	mm.	Amt.	in.	mm.	in.	hrs.	hrs.		
	°F	°F	°F	°F	°F	°F	°F	°F										
Railway Hill, Kuala Lumpur, Selangor	89.2	71.6	80.4	94	69	80	74	82.9	83.7	3.22	334.8	13.18	20	16	4	169.80	5.48	46
Bukit Jeram, Selangor	87.6	71.6	79.6	90	70	81	73	83.1	85.3	4.10	259.8	10.23	20	14	1	207.60	6.70	56
Sitiawan, Perak	87.6	72.1	79.9	91	68	78	75	82.7	83.5	1.57	149.1	5.87	17	14	5	172.90	5.58	47
Ipoh Aerodrome, Perak	88.3	71.4	79.9	92	68	74	74	81.6	83.0	3.10	254.3	10.01	14	12	7	160.60	5.18	43
Temerloh, Pahang	85.1	71.4	78.3	89	69	75	74	82.2	84.4	2.63	180.3	7.10	18	14	9	145.25	4.69	39
Kuala Lipis, Pahang	84.7	70.2	77.5	90	67	75	72	80.8	82.5	3.54	312.9	12.32	24	20	18	120.50	3.89	33
Kuala Pahang, Pahang	81.7	73.5	77.6	85	70	77	76	78.9	80.7	4.04	407.9	16.06	23	20		128.40	4.14	35
Kallang Aerodrome, S'pore	85.3	73.9	79.6	89	72	77	76	81.0	82.3	3.17	271.5	10.69	19	17	1	171.45	5.53	46
Bayan Lepas Aerodrome Penang	86.7	73.6	80.1	90	70	78	77	82.0	83.3	2.38	140.2	5.52	12	9	2	209.75	6.77	57
Malacca Town, Malacca	84.9	72.6	78.7	88	70	74	74	80.5	82.3	1.07	120.7	4.75	18	14	5	174.90	5.64	47
Kluang, Johore	85.3	71.2	78.3	89	69	74	73	79.9	81.3	3.59	324.1	12.76	20	16	3	168.00	5.42	45
Mersing, Johore	81.2	72.6	76.9	85	70	74	77	78.7	79.7	6.66	642.1	25.28	21	19		141.80	4.51	38
Alor Star, Kedah	86.4	70.9	78.7	91	67	77	74	82.0	83.7	0.55	40.4	1.59	10	6		193.60	6.25	53
Kota Bharu, Kelantan	82.3	71.5	76.9	86	67	74	75	78.9	81.7	9.66	1019.6	40.14	21	19	1	153.30	4.95	42
Kuala Trengganu, Trengganu	81.1	72.0	76.5	85	68	75	76	78.7	80.6	18.32	1414.3	55.68	21	20	1	136.25	4.39	37
Labuan	85.3	75.6	80.9	90	74	81	80	85.1	85.6	5.08	209.8	8.26	10	8	2	222.10	7.16	60
HILL STATIONS.																		
Fraser's Hill, Pahang 4268 ft.	69.3	60.6	64.9	76	58	64	63	69.4	70.3	2.29	302.8	11.92	24	23	1	104.85	3.38	28
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	70.0	56.6	63.3	73	48	65	62	68.0	68.5	1.54	182.4	7.18	24	15	2	97.70	3.15	26
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	69.9	58.1	64.0	74	55	65	60			1.64	197.4	7.77	22	15		102.00	3.29	28

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE
Malayan Agricultural Journal.

APRIL, 1939

EDITORIAL.

**Tea Production
in Malaya.**

The article on the Malayan Tea Industry in 1938, which is included in this number, summarizes available information on this subject. The development of the industry over the past few years proves that the confidence of the Department of Agriculture and of capitalists in the possibility of profitable investment in tea cultivation was justified.

We are aware of the difficulty experienced by the planter during the past year or so in laying down a development programme for the next few years. The root of this difficulty lies in the uncertainties connected with tea restriction. The first tea restriction scheme, of which Malaya was a partner, terminated at the end of March 1938, since when negotiations between this country and the International Tea Committee have proceeded, but have not yet resulted in a settlement. During this interregnum it has been impossible for the Tea Controller to issue licences to plant in excess of the total area previously agreed upon by this Government and the Committee. Under the circumstances the Tea Controller appears to have had no alternative, for the issue of further licences to plant would have prejudiced any new Agreement, and would have been against the principle of friendly co-operation between countries which are interested in the tea industry.

While, however, no new licences to plant will be issued, the Tea Controller, at the beginning of 1939, extended for a period of three months the licences to plant during 1938. In view of the very unfavourable planting season experienced in the latter part of 1938, this concession was most acceptable to the industry. Planting conditions during the first quarter of 1939 were little better, in consequence of which all licences to plant tea, which normally expired at the end of last year will remain valid till the end of June 1939.

Negotiations between this country and the International Tea Committee were opened some time before the first Agreement terminated, but after some months produced no agreement. The Malayan Government then invited the United Planting Association of Malaya to form a Tea Committee and to appoint a representative in London to re-open negotiations with the International Tea Committee. The Association accepted this suggestion and Sir John Hay agreed to negotiate with the Committee on behalf of the Association.

Sir John Hay has an intimate knowledge of the industry in Malaya and is therefore fully competent to present Malaya's case with ability and conviction. The tea industry in this country may therefore rest assured that the terms of agreement which he will eventually recommend for acceptance will be the most favourable possible for Malaya.

It is possible that further time may elapse before the terms of the new Agreement have been formally accepted by the other countries concerned. In view of this inevitable delay it has appeared desirable to the Tea Controller, F.M.S. and S.S., to allow the planting, under licences, of tea nurseries in the current rainy season by such companies or individuals as may desire to make an early start when agreement on Tea Regulation has been finally reached.

Persons desiring to plant tea nurseries in the F.M.S. or S.S. before 31st May 1939 are invited to apply to the Tea Controller, Department of Agriculture, Kuala Lumpur, for licences to plant. Proof of ability to secure seed will be required before licences are issued. It is to be understood that licences issued for small nursery areas will give no claim to subsequent licences for planting in the field. Licences for other than small nursery areas will not be issued until the completion of negotiations now in progress with the International Tea Committee. Forms of application may be obtained from the Tea Controller.

The Malayan Pineapple Industry.

During the Great War the exports of Malayan canned pineapples, which previously had exceeded 20,000 tons a year, declined to a mere 3,500 tons, but from 1919 the industry steadily expanded, until in 1937 the exports exceeded 80,500 tons, valued at over one million sterling.

The growth of the industry, however, was rather haphazard, due in a large measure to the fact that the pineapples were grown as a catch crop with young rubber, in consequence of which the canning industry did not bear the stamp of permanency. Grown as a catch crop the cost of production was so low that Malaya was able to create a demand and to market the produce at a cost which at that time defied competition.

During the past few years competition has become keener, the competition not only of canned pineapples from other regions, but of a wide range of canned fruits, and also of fresh fruit from various parts of the world transported under controlled storage conditions.

Lack of organization within the industry precluded adequate steps being taken to maintain and extend the market for the Malayan product. The world-wide trade depression rendered the position even more difficult and served to demonstrate still more clearly the urgency of re-organization within the industry. Eventually a point was reached where the price of the canned product was below cost of production and where large unsold stocks accumulated.

The possibility that some such situation would arise was visualized at least 10 years ago and resulted in a Pineapple Conference in Singapore in 1930 when an attempt was made to clarify ideas on the industry and to initiate improvements with the object of placing the industry on a sound financial basis.

Unremitting efforts in this direction have continued, and it would appear that the present organization of the canning industry, supported as it is by legislation, has at least laid the foundation of a new era of prosperity.

The Department of Agriculture is actively concerned with the operation of the legislation and the conduct of the Central Board of Pineapple Packers, Malaya, which has recently been formed. The Department is also developing research work on cultural problems and has commenced investigations on canning operations. The growing importance of the industry now justifies the regular issue of intelligence notes. A "Quarterly Report on the Malayan Pineapple Industry" has been established and will in future be regularly published in this journal. The Department has also developed a service whereby the Malayan pineapple industry will be kept fully informed, by means of a "Quarterly Summary of Miscellaneous Information on Pineapples" of developments in the pineapple industry in other countries.

The Malayan pineapple industry appears to have set about in earnest to put its house in order. We believe that although many difficulties will yet confront the industry, with the improved organization already initiated and which we hope will eventually be strengthened by embracing all branches of the trade—growers, canners and exporters—one may confidently anticipate that it will be possible to weather all storms and to establish the reputation of Malayan canned pineapples on the world's market as a cheap, wholesome fruit of unquestioned quality.

Original Articles.

THE MALAYAN TEA INDUSTRY IN 1938

BY

D. H. GRIST,

Agricultural Economist.

Prices.

The wholesale price of tea, not only of Malayan origin, but from most tea producing countries, was on a lower level during 1938 than in the previous year. Table I shows the average monthly prices obtained for Malayan tea on the London market, and for purposes of comparison, the prices obtained on that market for tea from other countries.

Table I.
London Prices of Tea.

per lb.

1938	MALAYAN				Ceylon	Java	India North	India South	Sumatra
	Number of Packages		Prices						
	Upland	Lowland	Upland	Lowland					
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
January	282	390	1 2.17	1 1.25	1 3.52	1 0.72	1 2.07	1 2.24	11.54
February	288	299	1 2.08	1 1.00	1 4.59	1 0.48	1 2.14	1 2.72	11.49
March	100	202	1 2.88	1 1.25	1 4.87	1 0.92	1 1.84	1 3.68	11.93
April	324	533	1 2.56	1 1.04	1 4.17	1 2.56	1 2.04	1 3.81	11.68
May	72	361	1 3.00	1 0.75	1 3.22	1 1.82	1 2.22	1 2.81	1 0.09
June	330	625	1 1.94	1 0.25	1 2.34	1 0.56	1 1.81	1 1.72	11.06
July	144	491	1 2.00	11.75	1 2.35	11.96	1 1.34	1 0.95	10.79
August	384	360	1 1.44	11.90	1 2.78	1 0.32	1 3.61	1 0.88	10.99
September	198	370	1 1.62	11.64	1 4.04	1 1.77	1 3.77	1 1.31	11.06
October	494	454	1 2.15	1 0.00	1 3.18	1 4.20	1 2.58	1 1.47	1 0.05
November	186	219	1 1.88	1 0.00	1 2.47	1 0.88	1 1.46	1 1.14	11.14
December	348	327	1 2.08	11.38	1 3.14	11.83	1 0.99	1 1.63	10.40
	3150	4631							

The average prices per lb. of Malayan tea on the London market during 1938 were: Upland 1s.2.15d., Lowland 1s.0.46d. Weighted average London prices for tea from other countries were as follows:—Ceylon 1s.3.34d., Java 1s.0.85d., India North 1s.2.24d., India South 1s.1.84d., Sumatra 1l.28d. Average prices (unweighted) in 1937 were:—Malayan upland 1s.2.9d., Lowland 1s.1.7d., Ceylon 1s.4.00d., Java 1s.1.76d., India North 1s.3.05d., India South 1s.2.69d., Sumatra 1s.0.20d.

The range of prices per lb. of Malayan tea on the London market was:—Upland 1s.3 $\frac{1}{4}$ d. to 1s. 1 $\frac{1}{4}$ d.; Lowland 1s.2d. to 1l., as compared with 1s.3 $\frac{3}{4}$ d. to 1s.1d. and 1s.3d. to 1l $\frac{3}{4}$ d. in 1937.

The Tea Agreement.

Under the first International Tea Agreement, which terminated on 31st March 1938, Malaya undertook that the area planted between the end of 1936 (when Malaya entered the Agreement) and the 31st March 1938, should not exceed 3,000 acres, or that the actual planted area in the country should not exceed 6,000 acres. Owing, however, to the short time available, the amount actually planted from 1st January 1937 to 31st March 1938 was only 1,272 acres, making the total planted area 4,716 acres on the latter date.

When the terms for a new Agreement to start on April 1st 1938 came to be considered the Malayan Government demanded that Malaya should be allowed to plant up to a total of at least 10,000 acres in all by the end of the second Agreement, *i.e.* by 31st March, 1943. The International Tea Committee, after first proposing that there should be no increase at all beyond the 6,000 acres allowed under the first Agreement, eventually made an offer of 7,000 acres as the total to be allowed by the end of the second Agreement.

The United Planting Association of Malaya approached the Government, stating that it considered that the minimum demand should be for 15,000 acres over and above whatever the area actually planted might be on 31st March 1938, *i.e.* roughly a total of 20,000 acres by March 1943.

The Government asked the United Planting Association to form a Tea Planters' Section or Committee to conduct future negotiations with the International Tea Committee, appointing its own representative in London for the purpose. The United Planting Association of Malaya agreed to this course and duly formed a Committee and appointed Mr. J. G. Hay (now Sir John Hay) to act as their representative.

In asking an unofficial body to conduct the negotiations, the Government merely conformed to the procedure of other tea growing countries, for the preliminary negotiations between the important tea growing countries and the International Tea Committee (itself an unofficial body) were conducted by representatives of the Tea Planters' Associations of those countries, so that in due course agreed proposals were submitted to the Governments concerned for consideration.

At the time of writing, no agreement between the Malayan representative and the International Tea Committee has been announced, a delay which although unavoidable, has curtailed natural development in this country.

During the negotiations, the Tea Controller, in order that planting should not be held up, and also in view of the desirability of clearing being carried out at an early date in order to provide employment, favourably considered suitable applications to plant during 1938. The licences to plant during 1938 were extended to the end of March 1939 because of the unfavourable planting weather experienced during the latter part of 1938.* Licences to plant issued since 1st April 1938 covered 1,934 acres, of which 1,197 acres had been planted by the end of the year.

Area under Tea.

The total area planted with tea in Malaya, showing years of planting, is given in Table II. It will be noted that the figures for the years before 1938 differ slightly from those given in the review of the industry for 1937.† The present figures are compiled from questionnaires sent to all estates at the end of 1938, and may therefore be considered as the more accurate. In addition, the area of tea planted on small holdings in the lowlands is estimated as in 1937 to be 559 acres, distributed as follows:—Johore 49 acres, Selangor 460 acres, Negri Sembilan 32 acres, Perak 6 acres, Pahang 5 acres, Penang 2 acres, Malacca 4 acres, Province Wellesley 1 acre.

With the exception of one small area, the upland tea is all situated at Cameron Highlands.

Table II
Area Planted with Tea, Malaya.
(Estates only, showing years of planting)
Acres

	Be- fore 1930	1930	1931	1932	1933	1934	1935	1936	1937	1938	Total Area	Res- erve Land
Upland Estates	98	325	164	86	43	52	269	336	613	1,237	3,223	4,900
Lowland Estates	1,087	188	63	6	—	6	81	88	175	682	2,376	2,216
TOTAL	1,185	513	227	92	43	58	350	424	788	1,919	5,599	7,116

* The licences to plant have since been extended to the end of June 1939.

† *Malayan Agricultural Journal*, Vol. XXVI No. 4.

The total area under tea, therefore, at the end of 1938 is estimated at 6,158 acres (estates 5,599 acres, small holdings 559 acres). The area of reserve land held by registered estates is estimated at 7,116 acres. It is probable, however, that the actual area of land available for tea planting is greater than this figure, as there may be areas of land alienated for tea planting for which the owners have made no application to plant, and other areas alienated under conditions which do not preclude the cultivation of this crop.

At the end of 1937, the area planted was stated to be 4,245 acres, comprising 2,041 acres upland tea, 1,645 acres lowland tea and 559 acres small holdings, and the reserve land was estimated at 6,404 acres.

Production.

The estate production of tea in 1938 amounted to 1,217,306 lbs. as compared with the estimate of 1,250,000 lbs.* The actual production was 507,654 lbs. upland and 709,652 lbs. lowland, and the estimate was 449,000 lbs. upland and 803,000 lbs. lowland. Thus, while the actual production was very close to the approximation, it would appear that production of tea per acre on upland estates may be greater than the present generally accepted figures, and lowland production rather less than anticipated.

The production of tea on small holdings is unknown, but judging by an inspection of the condition of most of these areas, it is probably in the region of 450 lbs. per acre, giving, for the year 1938, a production from this source of 250,000 lbs., and a total production for Malaya of 1,467,306 lbs. as compared with 1,251,071 lbs. in 1937. The annual production of tea on estates is shown in Table III. This table also shows that exports of Malayan tea in 1938 were 747,303 lbs. and sales for consumption in Malaya 434,624 lbs. Small-holding tea is also consumed locally, so that the "final" figures are:—exported 747,303 lbs., locally consumed 684,624 lbs.

Table III.
Malayan Production and Exports of Tea.

(Estates only)
in lbs.

Year	UPLAND			LOWLAND			TOTAL		
	Produce	Exported	Sold Locally	Produce	Exported	Sold Locally	Produce	Exported	Sold Locally
1930	—	—	—	95,040	35,730	59,310	95,040	35,730	59,310
1931	—	—	—	127,988	31,000	95,662	127,988	31,000	95,662
1932	4,382	—	3,161	138,694	16,472	123,101	143,076	16,472	126,262
1933	39,440	6,990	29,958	172,449	59,952	118,997	211,889	59,942	148,955
1934	115,874	44,072	64,510	228,497	74,843	152,789	344,371	118,915	217,295
1935	212,927	163,787	30,431	418,735	238,189	173,583	631,662	401,976	204,014
1936	327,796	253,308	79,162	616,970	397,074	210,788	944,766	650,382	289,950
1937	373,767	183,026	182,431	627,304	400,026	229,113	1,001,071	583,052	411,544
1938	507,654	292,296	198,978	709,652	455,007	235,646	1,217,306	747,303	434,624

* *Malayan Agricultural Journal*, Vol. XXVI, No. 4, page 158.

Consumption.

As stated above, the total consumption of locally-produced tea in 1938 was 684,624 lbs., as compared with 661,544 lbs. in 1937. In addition, net imports of tea during the year under review were 3,465,916 lbs., against 4,880,627 lbs. in 1937, giving a total consumption of tea in Malaya during 1938 of 4,150,540 lbs. as compared with 5,542,171 lbs. in 1937. The detailed figures and values of annual tea imports are shown in Table IV.

The Malayan population at the end of 1938 was estimated to be 5,278,866 persons, so that the consumption of tea in 1938 was a little over $\frac{3}{4}$ lb. per head.

No information of stocks of tea carried by dealers from one year to another is available, so that figures of total consumption in any one year must be treated as only approximately correct. There is little doubt, however, that consumption during the past few years has been of a lower order than for years previous to 1932, doubtless due to the changed economic condition of the inhabitants.

Table IV.
Net Imports of Tea into Malaya.

Year	Black		Green		Total Net Imports.	
	Quantity lbs.	Value \$	Quantity lbs.	Value \$	Quantity lbs.	Value \$
1923 ...	—	—	—	—	6,828,977	2,391,264
1924 ...	—	—	—	—	7,176,274	2,783,349
1925 ...	—	—	—	—	7,825,840	3,138,327
1926 ...	—	—	—	—	9,664,809	3,947,613
1927 ...	—	—	—	—	9,539,195	4,041,901
1928 ...	—	—	—	—	8,647,440	3,769,141
1929 ...	—	—	—	—	10,152,422	3,885,275
1930 ...	—	—	—	—	8,732,453	2,872,220
1931 ...	—	—	—	—	6,845,748	1,665,644
1932 ...	3,498,909	725,119	944,474	290,450	4,443,383	1,015,569
1933 ...	2,404,482	537,059	836,135	317,091	3,240,617	854,150
1934 ...	3,264,661	764,634	1,177,582	472,211	4,422,243	1,236,845
1935 ...	2,674,599	717,118	1,384,957	507,068	4,059,556	1,224,186
1936 ...	2,307,188	408,769	1,587,405	498,135	3,894,593	906,904
1937 ...	2,709,302	440,905	2,171,325	625,962	4,880,627	1,066,867
1938 ...	2,170,856	445,939	1,295,060	332,145	3,465,916	778,084

Imports of black and green tea were not shown separately before 1932.

Received for publication 27th February, 1939.

VARIATION IN TOXIC CONTENT OF ROOTS OF *DERRIS MALACCENSIS* VAR. *SARAWAKENSIS* WITH INCREASE IN AGE OF PLANTS

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Introductory.

An account was given in a previous number of this Journal⁽¹⁾ of a small-scale experiment carried out at the Central Experiment Station, Serdang, with the object of determining the optimum period of harvesting plants of *Derris malaccensis* var. *sarawakensis* from the point of view of maximum toxic content of root as judged by the ether extract.

The results of that experiment, which covered a period from 19 to 27 months, showed that the ether extract increased gradually to a maximum at 23 months. After this there was a steady decline as the plants increased with age.

In view of the wide variation found in the ether extract of roots from individual plants of *D. malaccensis* var. *sarawakensis* in the original *Derris* selection experiments⁽²⁾ and the fact that the original determinations were made on small samples of root the experiment has been repeated on a larger scale at Serdang.

Lay-out of Experiment.

The site chosen for the experiment was in Field 14.

The soil may be described as a dark yellowish-grey loam containing about 50 per cent. fine fractions.

The area was divided into 12 plots. Each plot measured 35 ft. x 39 ft. equivalent to approximately 1/32nd acre.

The plots were isolated by paths 6 ft. in width to prevent roots from one plot entering another.

A plan of the experiment is shown in Diagram I.

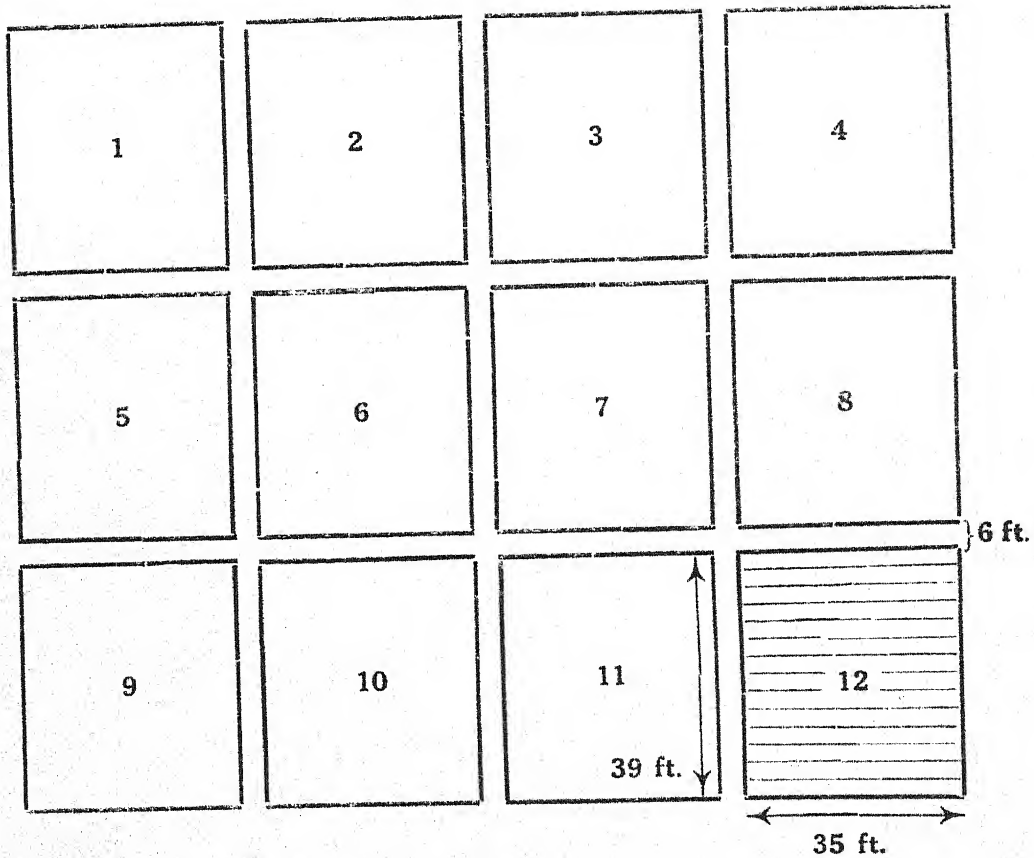
The cuttings were taken from a mixed population of plants and were randomized before planting.

The cuttings were set in rows 3 ft. apart with the same distance between the cuttings in each row. There were 13 rows in each plot with 12 cuttings in each row.

Harvesting of Roots.

Two rows of plants in each of the 12 plots were dug at the end of 15, 18, 21, 24, 27 and 30 months respectively.

Diagram I.
Arrangement of Plots in Harvesting Experiment with *Derris*
malaccensis var. *sarawakensis*.



The same procedure was adopted in each case. The stems of the individual plants were cut down to ground level after which the complete root systems were lifted. These were washed with water to remove adhering soil and the roots separated from the stems. The latter were discarded.

The roots corresponding to each two rows of plants were bulked, cut into short lengths of about 3 inches and dried in the sun to constant weight. Before weighing, any pieces of root having a diameter greater than $\frac{1}{2}$ inch were removed, the final weights being those of the air-dry marketable roots from each two rows of plants.

Yield of Root.

Table I gives the figures for yields of root at different ages.

Table I

**Weights of Air-Dry Marketable Roots from two Rows of Plants
of *Derris malaccensis* var. *sarawakensis* at Serdang.**

Serial No. of Batch	Age of Plants.					
	15 months	18 months	21 months	24 months	27 months	30 months
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1 ...	2.34	1.68	3.31	2.93	1.84	2.14
2 ...	2.22	1.66	2.44	2.73	2.04	0.92
3 ...	2.50	2.68	4.91	4.24	4.25	3.79
4 ...	4.14	4.65	4.49	4.59	4.51	5.41
5 ...	2.28	1.64	2.39	3.07	4.49	2.75
6 ...	2.79	2.19	2.71	1.73	1.62	1.03
7 ...	2.20	2.53	2.90	3.77	3.08	2.34
8 ...	3.05	2.28	2.72	3.69	4.00	4.96
9 ...	1.48	1.90	2.45	4.29	3.15	2.61
10 ...	2.87	2.20	2.10	2.71	2.04	1.38
11 ...	2.45	2.60	2.24	1.82	1.77	1.30
12 ...	1.75	2.11	2.77	2.70	3.70	4.79
Maximum	4.14	4.65	4.91	4.59	4.51	5.41
Minimum	1.48	1.64	2.10	1.73	1.62	0.92
Average	2.51	2.34	2.95	3.19	3.04	2.79

Although the experiment was not planned originally according to the principles of field experimentation, it was thought that a statistical examination of the results might be of interest. Table II gives the analysis of variance of the data of the yields of root from Table I.

Table II
Analysis of Variance of Yields of Root of *Derris malaccensis*
var. *sarawakensis* at Serdang.

	Degrees of Freedom	Sum of Squares	Mean Square	Standard Devia- tion	$\frac{1}{2} \log_e$ (Mean Square)	Z	Z at 5 per cent. point
Between age classes ...	5	6.312	1.262		0.116	0.068	0.425
Within age classes ...	66	72.668	1.101	lbs. 1.05	0.048		
Total ...	71	78.980					

The figures in the above tables indicate a low yield of root, which does not vary significantly over the period covered by the experiment. As will be seen from Table II, the calculated value of z is considerably smaller than that given in Fisher's Table of z for the 5 per cent. point.⁽³⁾

The minimum significant difference between any two age means can be calculated as 0.89 lbs., that is the t test shows no significance between any two class means.

Analysis of Roots.

A sample of roots for analysis was drawn on each occasion by the usual method of quartering.

Apart from a few samples, in which rotenone was determined specially and to which reference will be made later, the determination of the toxic content was restricted to the estimation of ether extract, the figures for which are shown in Table III. Table IV gives the analysis of variance of the data of the figures for ether extract from Table III.

The figures in Table IV show that the calculated value of z is greater than both of those taken from Fisher's Tables of z for the 5 and 1 per cent. points respectively.

The z test is therefore significant, indicating that the decrease in percentage of ether extract in the root can be attributed to the increase in age of the plants.

The minimum significant difference between any two age means can be calculated as 2.88 per cent.

The figures in Table III show a steady decline from 15 months onwards. A study of these figures and of the calculated minimum significant difference shows that, taking the figure for 15 months as a basis, the decrease in ether extract becomes significant only when the plants are 24 months old.

Table III

Ether Extract of Marketable Roots from two Rows of Plants
of *Derris malaccensis* var. *sarawakensis* at Serdang.

(Moisture-free basis)

Serial No. of Batch.	Age of Plants.					
	15 months	18 months	21 months	24 months	27 months	30 months
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1 ...	18.67	20.97	18.12	18.18	20.97	16.07
2 ...	24.77	23.19	23.72	16.82	20.82	22.22
3 ...	27.65	26.56	22.99	23.75	20.38	21.53
4 ...	24.88	29.72	23.83	23.32	22.68	22.25
5 ...	28.01	26.05	22.43	22.26	21.41	20.02
6 ...	23.40	23.49	25.88	26.22	23.57	19.79
7 ...	28.00	23.92	24.58	20.95	23.41	16.16
8 ...	24.78	20.06	24.14	24.05	21.30	17.45
9 ...	29.05	23.30	18.27	21.72	21.87	18.06
10 ...	21.76	24.80	21.44	20.60	20.49	20.85
11 ...	23.00	19.26	17.72	16.19	20.00	21.49
12 ...	25.40	19.54	18.40	20.87	14.26	21.58
Maximum	29.05	29.72	25.88	26.22	23.57	22.25
Minimum	18.67	19.26	17.72	16.19	14.26	16.07
Average	24.95	23.41	21.79	21.24	20.93	19.79

Table IV

Analysis of Variance of Ether Extract of Root of *Derris malaccensis*
var. *sarawakensis* at Serdang.

	Degrees of Freedom	Sum of Squares	Mean Square	Standard Devia- tion	$\frac{1}{2} \log_e$ (Mean Square)	Z	Z at 5 per cent. point	Z at 1 per cent. point
Between age classes	5	208.829	41.766		1.866	0.833	0.425	0.602
Within age classes	66	521.306	7.899	per cent. 2.81	1.033			
Total ...	71	730.135						

As mentioned previously, the rotenone content of a few samples was determined for the purpose of obtaining a further indication of the proportion which this constituent bears to the total ether extract for roots of this species of *Derris*. The results are given in Table V.

Table V
Rotenone Content and Proportion of Rotenone to Ether Extract
for Roots of *Derris malaccensis* var. *sarawakensis*
at Serdang.

Age of Plants	Serial No. of Batch	Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract	
months		per cent.	per cent.	per cent.	
27	...	1	4.22	20.97	20.1
do.	...	5	4.15	20.02	20.7
do.	...	9	4.31	18.06	23.9
30	...	2	4.39	22.22	19.8
do.	...	6	3.74	19.79	18.9
do.	...	10	4.07	20.85	19.5
Average				20.5	

Discussion.

The figures indicate a low yield of root for this species of *Derris*, which does not vary significantly over the period covered by the experiment.

Taking an average figure of 2.80 lbs. of air-dry marketable root per two rows of plants the calculated yield amounts to about 570 lbs. per acre. This is approximately half the normal yield usually reckoned when *Derris* is planted as a sole crop (4).

It is considered that this low yield of root can be attributed largely to the heavy nature of the soil. A heavy soil would appear to be definitely unsuitable for *Derris* mainly on account of difficulty of root penetration. Further, the difficulty and expense of harvesting root in such soils must not be overlooked.

Although the figures for ether extract do not confirm the observations made as a result of the original small-scale experiment carried out with this species of *Derris* in respect of a gradual increase in toxic content up to 23 months, both experiments indicate a decrease in ether extract after this age.

The relatively early optimum development of toxic content in the root shown in the present experiment is of considerable interest and further experiments with this species are in progress to confirm the present finding.

An early optimum development of toxic content in the root is of considerable practical importance, especially if further experiments reveal no significant increase in yield of root as the plants increase with age. It will enable better use to be made of the land and of the labour on the estate. Thus in the present experiment as far as yield of root is concerned the land may be said to have been occupied uselessly for 15 months—the whole period of the experiment. Further, from the point of view of return of toxic content per acre (product of yield of root and ether extract) the figures show that the root could have been harvested at any time from 15 to 24 months, after which the decrease in ether extract becomes significant, with a consequent reduction in the amount of toxic content per acre.

The results of the rotenone determinations show that the proportion of rotenone to ether extract is about 20 per cent. This is about 5 per cent. higher than that usually found for this species of *Derris*. Further determinations of the proportion are being made.

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Received for publication 5th March, 1939.

COVER CROPS.*

There are a number of cover plants employed to protect the soil and reduce weeding costs on land planted with permanent crops. The list of species cultivated is a large one, but the following selection has so far proved the most useful for general purposes. With the exception of *Mikania scandens*, which belongs to the Natural Order Compositae, all plants described are leguminous.

Calopogonium mucunoides.

A vigorous climbing or creeping herb with trifoliate leaves forming a dense mat of foliage, 1 to 2 feet high. The flowers are produced in short racemes, small, pale blue in colour. The flattened seeds are brown, and number about 34,000 per lb.

This cover will thrive on a wide range of soils, but is of the greatest value on new clearings, where it will cover the land in four months from sowing. When the shade of the permanent crop becomes dense, the growth of the cover weakens and in time dies down. *Calopogonium* has proved a valuable cover plant in young rubber and oil palm clearings, either sown as a sole cover crop or as a mixture with *Centrosema* or *Pueraria*. The advantages of sowing a mixture are seen when the permanent crop matures, as *Centrosema* is more hardy than *Calopogonium*, and gradually replaces the latter, while *Pueraria* will continue to thrive under shade. Although *Calopogonium* is liable to die down early, natural regeneration occurs under suitable conditions.

Centrosema pubescens.

A twining herb with trifoliate leaves, forming a loose mat of foliage about 18 inches deep on open land. It climbs any support with which it comes in contact. Flowers pale mauve with purple lines in the centre; three to five produced on a raceme. The seeds are flattened, brownish-green with dark green markings. The number of seeds per lb. is about 16,000.

Centrosema makes rather slow growth in the early stages, but when properly established forms an excellent cover. If the soil is sufficiently fertile, or where the permanent crop is manured, this cover plant will remain effective for many years and continue to thrive under shade. Care is necessary to prevent it from climbing young trees or retarding the growth of the permanent crop by excessive vegetation immediately below the trees or palms. For new clearings or replanting of rubber and oil palm areas it may be grown in combination with *Pueraria*, and a seed mixture consisting of 5 lbs. *Centrosema* and 2 lbs. *Pueraria* per acre has been found most suitable for this purpose.

Dolichos Hosei. Sarawak Bean.

A low, creeping, perennial herb of rather weak growth. Leaves trifoliate and slightly hairy. Several small yellow flowers are produced on a short raceme. The seed is brown in colour, blotched with chocolate markings. About 18,000 seeds weigh 1 lb.

* Copies of the following article, published as a second and revised edition of Agricultural Leaflet No. 6, may be obtained free from the Department of Agriculture, S.S. & F.M.S. They are not available for distribution outside Malaya.

The Sarawak bean thrives on a loose porous soil and is of particular value on the lighter types of alluvial coastal clay. It is most difficult to establish on undulating land that has suffered from soil erosion. Further, it is a shallow-rooting, moisture-loving plant, and will thrive under dense shade. It has a particular liking for wood-ashes, and on new clearings with abundant residues from burnt-off jungle, or where wood-ashes are applied to the land, vigorous growth is made. Owing to its prostrate habit, little or no trouble is experienced in preventing it from encroaching upon any permanent form of cultivation. It is an excellent cover crop in the fruit orchard or on flat nursery land.

Indigofera endecaphylla.

A low, creeping herb with dark green pinnate leaves and small purplish-pink flowers. The seeds are minute, light brown in colour and number about 220,000 per lb.

This cover plant thrives on land which has not suffered from erosion and it requires a moist rooting surface. It thrives from sea-level up to considerable elevations and is a suitable cover crop under tea. The plants send out trailers, which produce numerous adventitious roots, thus forming a dense low mat over the land. *Indigofera* is stated to develop a strong tap-root which assists materially in opening up the soil.

Mikania scandens.

A twining indigenous herb belonging to the Natural Order Compositae. Leaves opposite, 2 inches long. Flowers whitish, small and inconspicuous; produced in heads 2 inches wide. The seeds are so small and light that it is impracticable to collect them. The plant when once established spreads with extraordinary rapidity and owing to its twining habit all weed growth is completely checked.

Mikania will grow successfully on almost all types of soil but has been observed to make the most luxuriant growth on heavy alluvial coastal clays. Under such conditions it will cover open land with a dense mat within one month of planting the cuttings, hence it is called the "mile a minute" plant. Although non-leguminous, a dense mat of decaying organic matter is formed on the land. With present knowledge it is not possible to compare its value with the better known leguminous plants, but owing to its rank vigorous growth it appears to have a depressing effect on the development of young rubber and coconuts, particularly if the cover is not kept well away from the base of the trees.

Pueraria phaseoloides.

A strong twining herb, often attaining a considerable size in the wild state in Malaya. Leaves large, trifoliate, hairy. Flowers in racemes in scattered pairs, mauve in colour. Seeds small, dark brown. The number of seeds per lb. is about 37,000.

This cover plant thrives on the heavier types of soils and has proved successful on the alluvial clays of the coast. When once established, a dense thick cover, several feet high, is formed. The plant will continue to thrive under shade, but growth is less robust. It is a rather shy flowerer, consequently seeds are difficult to collect in quantity. Fortunately, *Pueraria* may be readily propagated from cuttings, which are lifted with numerous adventitious roots.

Owing to its hard coat *Pueraria* seed absorbs water irregularly and in consequence germination is spread over a long period. In order to obtain more rapid germination the seed may be soaked in water for three days and at intervals of 24 hours all swollen seed should be removed and sown immediately. A 1/9th inch mesh sieve is suitable for separating the swollen seeds. Alternatively, the difficulty may be overcome by rubbing the dry seed between two sheets of wire mosquito netting or abrading the seed coats in a mortar by mixing it with sand and stirring vigorously. As stated previously, this cover crop is often grown as a mixture with *Centrosema* on both new clearings and replantings.

Propagation.

The several methods of propagating the cover crops described are detailed below in tabular form. Cuttings may be used when seed is expensive or difficult to obtain.

In planting cover crops, whether from seed or cuttings, advantage should be taken of rainy weather and the land be as clean of weeds as possible. Before planting, the rows are lightly forked or cultivated. In the case of small seeds, an admixture of sand facilitates distribution. Seeds that have a hard seed coat or have been stored for some time will germinate more readily if soaked for a period of 24 hours in water raised to a temperature of 110°F. Seeds so treated should not be allowed to dry before sowing. On soils where erosion has already taken place, the addition of either basic slag or rock phosphate mixed with the seed in the proportion of about 10 lbs. of fertilizer to 1 lb. of seed and the mixture sown forthwith assists in establishing the cover plants.

Upkeep.

The main operations in establishing cover crops are systematic weeding between planting and maturity, and removal by hand of all noxious grasses and other growths that may appear through the cover crops. Further, in order to prevent competition for plant nutrients, it is important that a fair-sized circle round the main crop should be kept free from the cover plant.

Digging in the cover plant at intervals of one or two years may be adopted with beneficial results, but when funds are not available for this operation, slashing down the surface growth is recommended to allow of better aeration of the soil.

Covers Under Shade.

According to the Rubber Research Institute it cannot yet be claimed that a satisfactory technique for the establishment and maintenance of a good leguminous cover on mature rubber areas has yet been obtained. There are a few outstanding

Cover Crop.	Method of Propagation.	Rate per acre.	Remarks.
<i>Calopogonium mucunoides</i>	Seed	3-4 lbs.	Rows 3-5 feet apart.
<i>Centrosema pubescens</i>	Seed	5 lbs.	Rows 3 feet apart.
<i>Dolichos Hosei</i>	Seed	5 lbs.	Rows 3 feet apart.
	Cuttings	8 sacks	Rows 3 feet apart.
<i>Indigofera endecaphylla</i>	Cuttings (9 ins. long)	4 sacks	2 ft. x 2 ft. Seed may be used to provide nurseries for cuttings
<i>Mikania scandens</i>	Cuttings (12 ins. long)	2 sacks	5 feet apart.
<i>Pueraria phaseoloides</i>	Seed	3-4 lbs.	Rows 3-5 feet apart.
	Cuttings (2 ft. long)	10 sacks	3 ft. x 3 ft. Seed may be used to provide nurseries for cuttings

successes, but these have been generally accounted for by especially favourable conditions. Experience so far has shown that the important conditions for success appear to be the elimination of root competition, at least in the early stages of establishment, and the use of phosphatic fertilizers; on sandy soils in particular, extra potash may also be required.

Investigations have been carried out by the Institute in the inoculation of seed with the appropriate symbiotic organism; in nearly all cases inoculation has been found to stimulate the rate of establishment of leguminous covers.

References.

Articles on cover crops are obtainable from the Agricultural Economist, Department of Agriculture, S.S. and F.M.S., Kuala Lumpur.

Cover Crops and Green Manures, *Malayan Agricultural Journal*, Vol. XVI, No. 7, price 50 cents.

The Effect of Cover Crops on Soil Moisture, *Malayan Agricultural Journal*, Vol. XVIII, No. 10, price 50 cents.

QUARTERLY REPORT ON THE MALAYAN PINEAPPLE CANNING INDUSTRY,

December 1938 to February 1939.

*Prepared by the Economics Branch of the Department of Agriculture,
S.S. & F.M.S., from Reports of Field Officers.*

Factories.

The total number of registered factories is sixteen, of which only seven operated throughout the short season. Two old factories in Johore were re-conditioned and registered, making a total of eight registered factories in that State. Of the other factories two are in Selangor and six in Singapore. One Selangor factory worked at full capacity during December, but in February supplies of fruit were so short that it worked for only 3 days in that month. The fruit season in Johore ended early in January and most factories ceased work.

Production and Sales.

The production quota fixed by the Central Board for the short season October 15th, 1938 to March 31st, 1939, was 850,000 cases. By the end of February approximately 708,000 cases had been packed.

Singapore reports state that all the fruit packed during the season was sold at prices fixed by the Central Board.

The total exports of pineapples in 1938 amounted to 73,169 tons (or 2,351,006 cases), valued at \$7,262,851 (£854,453). The exports during the last months of 1938 and first two months of 1939 were as follows (in tons):—1938, October 4,622; November 4,060; December 4,500; 1939, January 4,487, February 6,884.

The Central Board of Pineapple Packers, Malaya.

Following a long period of uneconomic prices for canned pineapples during 1937 and 1938, the pineapple packers of Malaya formed an Association, during the latter half of 1938, for the purpose of controlling the output of all factories, and fixing the price of canned pineapples at a profitable level. As this Association—the Central Board of Pineapple Packers, Malaya,—would have had little hope of continued existence without legislative backing, they applied to Government for support. The Pineapple Industry Ordinance and Enactments of the Straits Settlements, Johore and Selangor, have been amended to enable the Registrar to refuse to register a pineapple factory the owner of which does not belong to an association representing the pineapple packers of Malaya. The Registrar may also refuse to register a factory provided he is satisfied that there are already sufficient factories to deal with the produce from existing areas under pineapples.

Two important points included in the rules of the Association are:—

1. Growers of pineapples are paid a fixed price for their fruit which is regulated in direct ratio to the price of the canned product.

2. The Malayan Mark Scheme for pineapples (Malayan Mark Pineapple (Grading & Marketing) Regulations, 1938) will be adopted by all packers and will be compulsory after the lapse of two years.

The participating Governments are represented on the Central Board and according to the Rules these representatives have overriding powers, especially in matters affecting the interests of growers and exporters, who are themselves entitled to attend general meetings and to express their views.

The Central Board has continued to function satisfactorily and its rules and by-laws have been accepted by the three Governments concerned (Straits Settlements, Selangor and Johore) after certain amendments had been agreed upon and accepted by the Association.

Although the Association has not yet been legally nominated by these Governments as representing the pineapple industry of Malaya, the Pineapple Industry Ordinance and Enactments have been amended to enable the Governments concerned to do this as soon as formalities regarding the registration of the Association are completed.

Prices.

The formation of the Central Board and its satisfactory operation during the past few months have changed the whole outlook of the pineapple industry from one of deep depression to considerable optimism.

A committee is in process of formation, consisting mainly of officers of the Department of Agriculture, to investigate and devise means to ensure that the grower gets full benefit from the higher prices fixed by the Board, as much of the fruit passes through the hands of dealers before reaching the factories.

The price of fresh fruit bought in the field has varied according to distance from factory and the amount and quality of available fruit. With shortage of supplies prices tended to rise. Singapore prices of fresh fruit, per 100, were from \$1.80 to \$1, while South Johore prices varied from \$1.60 to \$1.20 for first quality, \$1.20 to 60 cents for second quality, and 90 to 60 cents for third quality. In Selangor, the price was between 80 and 50 cents per 100. In this State arrangements were made whereby information regarding changes in price of fresh fruit will be conveyed to growers.

Quotations in Singapore in dollars per case of 48 cans of 1½ lbs. each, during the three months under review, were as follows:—

Month	General Average Quality. (G.A.Q.)			Golden		
	Spiral	Round	Cube	Spiral	Round	Cube
December 1938 ...	2.90	3.80	3.00	3.20	4.00	3.25
January 1939 ...	2.95	3.80	3.00	3.20	4.00	3.25
February 1939 ...	3.00	4.00	3.00	3.40	4.30	3.45

Miscellaneous.

ANNUAL PRIZE DISTRIBUTION, SCHOOL OF AGRICULTURE, MALAYA.

The annual prize distribution at the School of Agriculture, Malaya, was held at the School on 6th April, 1939. Amongst those present in addition to the staff and students were the Hon'ble the Acting Adviser on Agriculture, and the majority of the members of the School Advisory Committee.

The Principal of the School (Mr. G. E. Mann, M.C.) opened the proceedings by regretting that the Hon'ble the Federal Secretary, Mr. C. D. Ahearne, who was originally invited to present the awards, was prevented by other engagements from doing so. He welcomed the visitors and stated that the Hon'ble Mr. W. N. C. Belgrave, Acting Adviser on Agriculture, had kindly consented to distribute the prizes.

Progress of the School.

Mr. Mann then outlined the activities and progress of the School during the past year. He reminded his listeners that the School had now completed its eighth academic year which began in May 1938 with 62 students and pupils in residence, which was 18 short of capacity. During the year 2 students and 2 pupils were withdrawn, leaving 58; of these, 18 students and 15 pupils were leaving that day on the conclusion of their respective courses of training. Present indications were that some 25 students and 20 pupils would be admitted next month and that the Two Years Course would be full. A small waiting list had had to be opened as the number of applications for admission to the Major Course as private students had exceeded the number of vacancies. It was clear that the Two Year Course continues to be attractive and that the position as regards private students remains satisfactory.

Scholarships.

The Principal announced that the F.M.S. Government had increased its number of Major Scholarships from 6 to 8, of which 4 had been opened to non-Malays. The provision for other Government Scholarships remained unchanged, namely 6 Minor Scholarships for the Federated Malay States and 3 Major and 3 Minor Scholarships for the Straits Settlements. In addition, there was the Edwin Philips Scholarship and, as new ventures, it was expected that next term 2 Malays and 1 Indian would probably be awarded Scholarships by the Captain Kling Mosque Endowment Fund of Penang on the one hand and by an estate in Negri Sembilan on the other hand.

Prospects of Employment.

The speaker reminded his audience that this is primarily a vocational school, at any rate as far as the Two Years Course is concerned, and that public interest centres very largely on the record and prospects of employment. Of the 223

students and pupils who had completed their training by the end of last year, 176 were known to have found salaried posts. The actual figure was probably higher as some old boys had not kept in touch with the School. The large majority of these 176 had been absorbed into Government service and the Rubber Research Institute of Malaya, but some 17 old boys had found their way into commercial enterprises as employees on estates or in firms.

Of the 33 boys now leaving, Mr. Mann expected that 4 would enter the Department of Agriculture and 5 the Rubber Research Institute, while one would resume duty as an Assistant Penghulu. He was confident that, as in the past, the majority of second year students would find employment in one capacity or another.

Continuation Scholarships and Paid Apprenticeships were now offered by the F.M.S. Government to selected Malays who had obtained the School Diploma and wished to receive a more intensive training as conductors on estates. Two such scholarships were awarded last July. One of the holders failed to make satisfactory progress and his scholarship was therefore terminated; the other was getting on well and it was understood that he stands a very good chance of finding a salaried post if he wants to when his apprenticeship ends.

School Activities.

The Principal stated that the curriculum had had time to settle down into smooth working order. On the practical side, the value of the weekly field day at the Central Experiment Station and of special courses on subjects such as bud-grafting of rubber and the kiln-drying of copra had continued to be emphasized.

He regretted that there had been some falling off of enthusiasm over organized games and reminded those of his audience who would be second-year students very soon that he looked to them to restore that keenness on games which was formerly so noticeable and gratifying.

The Old Boys Society, inaugurated two years ago, had continued its unostentatious existence. Its members were comparatively few and scattered so that the principal activity of the Society at present lay in assistance to the School Magazine, the third number of which was published last October.

Poultry.

The speaker continued:—"Our poultry section continues to attract considerable attention as is evidenced by the fact that revenue from this source last year was \$1,400. Comparative observations on the growth-rate and productivity of Rhode Islands, native and upgraded birds have been continued and sufficient information has now been acquired to enable me, in collaboration with various field officers, to design field experiments which aim at testing the practical value of cheap supplementary rations under average kampong conditions. The health of our flocks has remained good on the whole, there being no outbreak of any of the epidemic diseases which periodically cause such heavy losses in the villages."

In conclusion Mr. Mann recorded the great interest which the McLean Commission on Higher Education took in the School when they visited it in November last. He also paid a tribute to his staff and to other officers of the Department of Agriculture and the Rubber Research Institute for help and advice willingly given during the year.

Mr. Mann then called upon Mr. Belgrave to distribute the prizes, diplomas and certificates which had been gained by students and pupils leaving the School that day.

Speech by the Acting Adviser on Agriculture.

In the course of his remarks to students and pupils now leaving the School, Mr. Belgrave emphasized that the extent to which their present training would be justified and repaid depended on the way in which they applied the knowledge and experience gained to the problems confronting them.

The deeper they studied the subject the more they would realize that we knew very little about the natural laws governing agriculture, because the visible result—the growth of the plant—was only the end of a complicated and invisible network of a great number of forces, which might be acting in different directions. He suggested, however, that when in after life they met with results which appeared to conflict with accepted teachings they should not be discouraged, but should study the subject further, and should not hesitate to seek to take advantage of the advice and help of those more experienced.

Mr. Cheeseman, Chief Inspector of English Schools, in a happy speech delivered in the Malay language, urged that the knowledge and experience they gained in their studies should in after life be translated into action. The most impressive advice, he said, was not the spoken word but the speaking action, the living example. The practical success of their diligence, energy and attention to hygiene, and above all, the successful application of the methods they had learnt at school, would, by example, bring about a great change in the life in the villages. The Education and Agricultural Departments, he concluded, were working together for the Malays of this country with but one end in view—the happiness and prosperity of the race. He hoped that the Malay students from this school would do their utmost to further this prosperity.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE, 22nd March, 1939.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 22nd March 1939, under the chairmanship of the Hon'ble the Acting Adviser on Agriculture, Malay States. There was a full attendance of members of the Committee.

The following abstracts from the minutes of the meeting deal with discussions on various crops.

The Pineapple Industry.

The research factory at Johore Bahru has not yet started operation. The installation is complete with the exception of one machine.

No factory is yet employing the Malayan Mark, but it is hoped that it may be possible to do so by about the end of this year or early in 1940.

Tea.

Experiments at the Central Experiment Station, Serdang, on Chinese tea manufacture have not been as successful as was anticipated. Dealers had criticised the steamed taste of the tea and had indicated that they require a dry heat method of preparation. Work on this line has been undertaken but the cost of manufacture has been high, the estimated factory cost being about 8 cents per kati.

It is considered unlikely that it will be possible to reduce the all-in cost of China tea below 20 cents per lb. *i.e.* about 2 cents per lb. less than the cost of Indian tea at the Central Experiment Station. The intention of the experiments was to find an outlet for local estate teas on the cheaper Malayan market.

It was agreed that there is at present no point in proceeding further with these experiments at the Central Experiment Station in view of the fact that the vast majority of China tea consumed in Malaya is taken by the labouring classes, who can afford only the very cheapest article.

Compost.

An article on composting has appeared in the *Malayan Agricultural Journal* and a leaflet on the subject has been published by the Department. Good results have been obtained with compost for vegetable growing at Cameron Highlands and an experimental programme is now being considered. A member suggested that it is desirable that a further article on this subject be published in the *Malayan Agricultural Journal* in which the cost of production of compost might be indicated. The Chairman agreed to consider this suggestion and, if possible, to show the expenditure of labour in its preparation at Serdang, also to include in the article comments from other sources on the subject.

Supply of Rubber Budwood to Small-Holders.

The Chairman reported that satisfactory progress had been made in regard to budwood nurseries at various Agricultural Stations, and that a total area of about 25 acres had been established. Growth is generally satisfactory.

Manila Hemp.

Reports from two dealers in London on samples of Manila hemp prepared at the Central Experiment Station, Serdang, have been received. A machine from British North Borneo has been installed at the Central Experiment Station. The results, however, have been unsatisfactory as labour costs are too high. Endeavours are now being made to obtain a Dyak expert from British North Borneo to demonstrate the proper working of the machine.

Papain.

In March, 1938, a letter was received from a Canadian firm regarding their interest in procuring papain and asking to be put into touch with producers. A notice to this effect was inserted in the *Malayan Agricultural Journal* for March, 1938, and as a result about fourteen letters were received from persons interested in the matter. The addresses of these were sent to the Canadian firm and the latter has communicated direct with some of them. The Department has distributed notes on the cultivation of papaya and production of papain to all enquirers.

EMPLOYMENT FOR EX-STUDENTS OF THE SCHOOL OF AGRICULTURE.

A few students (mainly Chinese) who recently left the School of Agriculture on completion of their Two Years Course of training are desirous of finding employment. Enquiries from managers of estates or other employers would be welcomed and should be addressed to the Principal.

Departmental. FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

March, 1939.

The Weather.

The weather has been dry in most localities. Showers and storms have occurred and the total precipitation approximated to normal. Showers became more frequent during the last part of the month.

In North Perak some exceptionally heavy storms occurred. The rain gauges at Taiping and Maxwell's Hill recorded 23.13 and 18.80 inches respectively, which is considerably in excess of the average for March.

In Selangor coastal areas rainfall was low.

Crop Reports.

Rubber.—Trees have been wintering. Owing to the resultant lower yields and also owing to the fact that most small-holders had used up their allowance of coupons, very little tapping has been done. Prices remained at about the same level as in February, ranging between \$32 and \$36.20 a picul for smoked sheet according to locality.

The usual seasonal occurrence of mild attacks of *Oidium Heveae* has been reported from many districts.

It is mentioned in the Perak report that in Parit District alone 2,500 acres of jungle land have been taken up by Malays for rubber planting.

Padi.—The harvest is still proceeding in Krian. Yields are said to be slightly higher than last year, but quality is reported to be rather poor. As planting was not carried out simultaneously, harvesting will continue over a long period. There will, therefore, be no shortage of labour. Rates for harvesting have now dropped to 15 gantangs for each 100 reaped plus food and 50 cents in cash per relong (0.71 acre).

The sealing of bags of Seraup 48, passed by Departmental officers as being sufficiently pure to warrant the payment of the premium, commenced in the fields on February 19th. It was later decided to examine and seal this padi at the mills as well as in the field and sealing commenced at Parit Buntar Mill on March 5th and at Bagan Serai on the 14th. At the present time 90 per cent. of the sealed padi taken by the Parit Buntar Mill is sealed at the mill and not in the field, whilst the corresponding figure for Bagan Serai Mill is 50 per cent.

In Malacca yields are generally rather lower than last season but a fairly good crop has been reaped in inland areas near Alor Gajah.

The harvest in Kelantan is nearing completion. The dry-land padi crop has been patchy, but in most localities yields have been better than last year. Late planted areas are yielding poorly.

All the small rice mills recently erected in Kedah, Province Wellesley and Perak are working at full capacity. Some of the owners have taken advantage of a brisk

demand for milling to increase their charges from $\frac{1}{2}$ to $\frac{3}{4}$ gantang for each 10 gantangs of padi milled. Two new mills have been erected in Kedah.

At the Temerloh Mill padi is being bought at the rate of about 73 piculs per day which is unusually brisk buying for this mill. During the period 29th January to 24th March a total of 3,858 piculs has been purchased, which slightly exceeds the total amount bought during the year 1938. There still remains a large quantity of padi to be bought, and it is estimated that at least a further 2,000 piculs will be forthcoming in the Temerloh District.

Agricultural Instruction.

The Farm School at Ayer Itam, Penang, opened on March 1st. There are now 12 pupils, which is as many as the instructor can satisfactorily teach. Vegetable plots have been planted by each boy, and expeditions are being arranged for every Saturday. Arrangements are being made to hold a carpentry class once a week. Ex-farm school students have found that they have needed to build themselves poultry houses and pig sties, and a knowledge of carpentry would have stood them in good stead.

The following is a quotation from the Kedah monthly report:—

“ Fourteen schoolboys of Standard VII attended a two weeks' course on the Gajah Mati Agricultural Station from 23.1.58 to 8.2.58 (15th March—30th March, 1939). Field work covered poultry management (hens and ducks); budding and marcotting, preparation of fungicides and insecticides, composting and vegetable cultivation. Lectures were given by the Assistant Agricultural Officer in charge (after these had been examined and approved in draft). This instruction at the Agricultural Station forms part of the year's course for Standard VII and VIII boys which is now being brought into being. Some subjects are more easily treated at the Agricultural Station than at the Sungai Korok School (where the greater part of the instruction is to be given). A second 2 weeks' course at Gajah Mati is contemplated later during the year. Boys were accommodated on the Station and did all their own cooking, etc.”

Other Matters of Interest.

The Agricultural Officer, Brunei, recently visited Jesselton and Kota Belud Districts of British North Borneo to make preliminary arrangements for the shipment of buffaloes to Brunei for sale to padi cultivators. Twenty-nine animals have already been purchased and shipped, and arrangements were made for shipping a further 200. The export of buffaloes from certain districts in British North Borneo has been banned for several months owing to an outbreak of “surra” disease among ponies.

The fact that a well-managed orchard can be very profitable was mentioned in the January number. A further instance is that at Sungei Choh in Selangor where the harvesting of a duku orchard has recently been completed. From an area of $6\frac{1}{2}$ acres 800 boxes of fruit were harvested which were sold at \$2.70 per box, representing a gross return of \$2,160.

DEPARTMENTAL NOTES.

Visitors.

H. S. H. Prince Lakshanakara Kashemsant of the Ministry of Agriculture, Siam, and Luang Vichien Dhatukar of the Ministry of Economic Affairs, Siam, recently visited the headquarters of the Department of Agriculture, S.S. and F.M.S., at Kuala Lumpur, the Central Experiment Station, Serdang, and the Agricultural Station, Cameron Highlands.

Translation of a Text Book on Rubber.

By arrangement with the Rubber Research Institute, the Department of Agriculture, S.S. and F.M.S., has now completed and distributed Malay and Chinese editions of a book on Rubber-Growing: Elementary Principles and Practice, which was published in English in 1938 by the Rubber Research Institute of Malaya. These editions in the vernacular languages have proved so popular and have been of such assistance to the Asiatic Rubber Instructors that a version in the Tamil language will be published in the course of a few months' time.

Rice Mills Give Bonus for Selected Padi.

The Government Rice Mills in Krian, Perak, continue to give a bonus of 10 cents per picul for the variety of padi known as Seraup Kechil 48, contained in sacks sealed by officers of the Department of Agriculture. This variety, which was isolated by the Department as a result of many years' work at the Padi Experiment Station at Krian, proves to be particularly acceptable owing to its excellent milling qualities.

The area cultivated with this strain is steadily increasing. From February 19th, when sealing of sacks commenced, until the 28th March, 78,000 sacks of padi received at the Government Mills obtained the bonus, only about 100 sacks being rejected, while of the total amount of padi received at one mill nearly 50 per cent. was sealed padi.

Leave.

Mr. F. Birkinshaw, Chief Field Officer, returned from leave on 23rd February 1939. Mr. A. E. Coleman-Doscas, Acting Chief Field Officer, has returned to his substantive post of State Agricultural Officer, Johore.

Mr. H. T. Pagden, Entomologist, returned from leave on 10th March, 1939.

Mr. H. J. Simpson, Agricultural Officer, returned from leave on 17th March 1939, and assumed duty in the post of Agriculturist with effect from 18th March 1939.

Mr. C. L. Newman, State Agricultural Officer, Selangor, has been granted 243 days leave from 11th March 1939.

Mr. B. A. Lowe, Agricultural Officer, has been granted 240 days leave from 11th March 1939 inclusive.

FERTILIZER PRICES, MARCH, 1939.

The following are the prices at the end of March, 1939, of some of the more important fertilizers.

more important fertilizers.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39	—	—	105.00
Superphosphate ...	—	—	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00
* Total					

* Citric soluble. ‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical. MARKET PRICES.

March 1939.

Major Crops.

Rubber.—The political tension in Europe was responsible for a fall in the rubber market in the second half of the month. No 1 X. Rubber Smoked Sheet, loose, opened in Singapore at 28½ cents per lb., and improved to 29 cents on the 9th March. There followed a fall to 27½ cents on the 18th, and a further sharp fall to 26½ cents on the 20th. The price immediately recovered, however, and the market closed at 27¼ cents.

The average of daily quotations was 28.11 cents per lb., as compared with 27.24 cents in February. The London average quotation per lb. was 8.14 pence and New York 16.21 cents gold, as compared with 7.96 pence and 15.85 cents gold in February.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.
Weekly Prices Paid by Local Dealers for Small-Holders' Rubber,
March, 1939.

(Dollars per picul of 133 1/3 lbs.)

(Dollars per picul of 105 1/2 lbs.)

Grades	Kuala Kangsar, Perak	Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.				
	15	2	9	16	1	8	15	22	29
Smoked Sheet ...	35.00	35.77	36.20	35.50	—	—	—	—	—
Unsmoked Sheet ...	—	34.50	—	35.00	34.50	34.00	33.61	32.60	31.91
Scrap ...	No purchases								

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases of rubber at Kuala Kangsar on 1st, 8th, 22nd and 29th, and at Kuala Pilah on the 23rd and 30th March.

Palm Oil.—Prices again improved slightly during March and are given in Table II. The February averages of weekly quotations were:—palm oil £13.3.9, kernels £8.13.2.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
March 3	£ 13. 10. 0 Liverpool	£ 9. 0. 0 Hamburg
" 10	13. 15. 0 "	9. 1. 3 "
" 17	13. 15. 0 "	8. 17. 6 Rotterdam
" 24	13. 10. 0 "	8. 15. 0 "
" 31	13. 5. 0 "	8. 10. 0 "
Average	£ 13. 11. 0	£ 8. 16. 9

Copra.—The improvement noted in this market in February was not maintained in March, and the sun-dried grade fell steadily from an opening price in Singapore of \$3.80 per picul to \$3.40 on the 30th, but closed on a rising note at \$3.45. The average Singapore price for this grade was \$3.64 per picul, and for the mixed grade \$3.34, as compared with \$3.53 and \$3.23 in February.

Copra cake continued unchanged at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in February were as follows:—Siam No. 2 Ordinary \$4.02, Rangoon No. 1 \$3.07, Saigon No. 1 \$3.27, as compared with \$4.22, \$2.92 and \$3.30 in January and with \$4.15, \$3.82 and \$3.92 in February 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were: Singapore 27, Penang 32, Malacca 30, as compared with 27, 32 and 30 in January.

The average declared trade value of imports during February was \$3.68 per picul, as compared with \$3.78 in January and \$3.85 in December and \$3.85 in February 1938.

Padi.—In Perak, padi prices per 100 gantangs (gallons) were between \$7 and \$8, with the exception of Perak South where prices ranged from \$6.50 to \$13. In Pahang the range was from \$8 to \$12, Kedah \$6.50 to \$7.50, Malacca \$9 to \$10, and Negri Sembilan \$7 to \$13. In Kelantan and Penang the price was \$8.

The Government Rice Mill at Bagan Serai, Perak, increased its price for padi from \$2 to \$2.10 per picul towards the close of the month, but the other Government Mill at Parit Buntar maintained its price unchanged at \$2. The Government Rice Mill, Temerloh, Pahang, paid \$2.20 per picul.

Pineapples.—Singapore prices of canned pineapples, per case of 48 cans of 1½ lbs. each, as fixed by the Central Board of Packers were as follows:—G.A.Q. Spiral \$3.05, Round (Flat) \$3.85, Cube \$3.10; Golden \$3.45, \$4.25 and \$3.50 respectively.

Fresh fruit prices in Singapore were \$1 to \$1.50 per 100, and in Selangor 50 to 80 cents.

Beverages.

Tea.—Two consignments of Malayan highland tea, comprising 132 packages, were sold on the London market during March at 1s.2½d. and 1s.3d. per lb. Six consignments of lowland tea (502 packages) were sold at prices ranging from 10¼d. to 1s.0¼d. per lb., the average price being 11.63d. per lb.

According to the *Tea Market Reports* for March of the Tea Brokers' Association of London, the average London prices per lb. realized for tea from other countries were as follows:—Ceylon 1s.3.95d., Java 1s.1.25d., Indian Northern 1s.0.68d., Indian Southern 1s.2.44d., Sumatra 10.65d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 28th March 1939 of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 85, Medium Grown Teas 73, Low Grown Teas 66.

Coffee.—Liberian coffee was quoted throughout the month at \$14.50 per picul. Excelsa opened at \$10.25, fell to \$10, and recovered to \$10.25. Robusta opened at \$6.50, fell to \$6, and recovered to \$6.50.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$9.20 to \$10.95, and for Sourabaya coffee \$11.13 to \$12.25, the price within these ranges depending upon quality.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$7.08, Medium \$6.49, Mixed \$6.01.

The averages of highest and lowest quotations per picul in Singapore were as follows:—Splits \$8.25 to \$12.20; Red Whole \$4.75 to \$6.35; Sliced \$4.45 to \$6.55; as compared with \$4.50 to \$7.60, \$6.20 to \$9.37, and \$9 to \$11.75 respectively in February.

Pepper.—There was almost complete lack of demand during March, and prices fell in the second half of the month. Average Singapore prices per picul were:—Singapore Black \$8.37, Singapore White \$13.19, Muntok White \$13.49, as compared with \$8.62, \$13.19 and \$13.44 in February.

Nutmegs.—The Singapore price for both 110's and 80's fell to \$28 per picul, and the month's average was \$28.50, as compared with \$29.50 in February. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Nominal quotations for Siouw in Singapore remained unchanged at \$85 per picul. Amboina was quoted throughout the month at \$58. The February average prices were \$82.50 and \$60 respectively. In Penang, locally produced mace, dry, was sold at \$75 per picul.

Cloves.—Singapore nominal quotations for both Zanzibar and Amboina continued unchanged at \$40 per picul. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* for 27th March 1939 from Rs. 1.12 to Rs. 1.23 per lb.

Miscellaneous.

Derris.—There was no change in the March average prices in Singapore for roots sold on a basis of ether extract which were \$8 to \$10 per picul. Roots sold on a basis of rotenone content averaged \$17.50 to \$19.50 per picul, as compared with \$18 to \$20 in February. Demand slackened somewhat during the month and roots were again more freely available.

Gambier.—Prices continued unchanged in Singapore during March: Cube No 1 \$15 per picul, Block \$7 (nominal) per picul.

Sago.—Pearl was quoted throughout the month at \$3.80 per picul in Singapore as compared with an average price of \$3.71 in February. Flour, Sarawak Fair, also improved to average \$2.29 per picul, as compared with \$2.24 in February.

Tapioca.—Flake Fair was quoted throughout the month in Singapore at \$3.85 per picul, as compared with the February average of \$3.89. Seed Pearl and Pearl Medium continued unchanged at \$3.90 and \$4.50 respectively.

Tobacco.—Kelantan prices for prepared tobacco were lower: 1st quality \$108, 2nd quality \$80, 3rd quality \$65 per picul. In Perak the range of the three grades was \$22 to \$42; \$14 to \$28; \$7 to \$22; in Kedah \$35 to \$45; \$25 to \$33; \$14 to \$24; in Pahang \$16 to \$40; \$10 to \$26; \$5 to \$18; in Negri Sembilan \$15 to \$22; \$10 to \$14; \$8 to \$12. In Malacca the 1st quality ranged from \$19.50 to \$23.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY *

February, 1939.

Malaya.—The February imports of foreign rice were 77,106 tons,† and exports 15,107 tons, net imports being 61,999 tons as compared with 52,402 tons in 1938.¶

Of the February imports 56 per cent. were consigned to Singapore, 13 per cent. to Penang, 6 per cent. to Malacca, 19 per cent. to the Federated Malay States and 6 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 53,803 (69.8), Burma 19,059 (24.7), French Indo-China 3,179 (4.1), other countries 1,065 (1.4).

Of the exports during February 71 per cent. were consigned to the Netherlands Indies and 29 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 9,584 (63.4), Burma 4,419 (29.3), French Indo-China 683 (4.5), parboiled 348 (2.3), Malayan production 73 (0.5).

February net imports, by countries of origin, were (in tons, percentages in brackets):—Siam 44,219 (71.3), Burma 14,640 (23.6), French Indo-China 2,496 (4.0), other countries 644 (1.1).

India.—Foreign exports during January were 18,000 tons, equalling exactly the exports in 1938. Of these exports 44.4 (50.0) per cent. were to Ceylon, 5.6 (5.6) per cent. to the Straits Settlements and the Far East and 50.0 (44.4) per cent. to other countries. The figures in brackets are for 1938.

According to the final rice forecast for the season 1938-39 for All-India, the area and yields of rice are estimated at 72,574,000 acres and 23,577,000 tons, showing an increase of 0.03 per cent. in area but a decrease of 11.9 per cent. in yield as compared with the previous season. The condition of the crop appears to be fair on the whole.

Burma.—Foreign exports from the 1st January to the 1st March totalled 684,249 tons, as compared with 556,987 tons in 1938, an increase of 22.8 per cent. Of these exports 61.4 (48.3) per cent. were to India, 6.6 (9.8) per cent. to the United Kingdom, 5.6 (3.5) per cent. to the Continent of Europe, 12.0 (15.2) per cent. to Ceylon, 8.3 (14.6) per cent. to the Straits Settlements and the Far East, and 6.1 (8.6) per cent. to other countries. The 1938 corresponding percentages are given in brackets.

Average February prices in rupees per 100 baskets of 75 lbs. each in Rangoon were:—Big Mills Specials 193, Small Mills Specials 195.

According to the final forecast of the rice crop in Burma for the season 1938-39, the area likely to mature is estimated at 12,529,200 acres, a decrease of 61,900 acres or 0.5 per cent. as compared with the final figures for the previous season.

* Abridged from the Rice Summary for February 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.).

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

The district estimates now indicate a total yield of 8,044,000 tons of padi, and an exportable surplus of 4,797,000 tons of padi, the equivalent of 3,550,000 tons of rice and rice products.

Siam.—The 1938 exports of rice and rice products from Bangkok totalled 1,450,897 tons as compared with 943,224 tons in 1937.

Japan.—The total area under rice in Japan for the year 1938 was officially reported as 7,890,774 acres, representing an increase of 0.2 per cent. over 1937.

The final figures for the second Formosan rice crop of 1938 amounted to 691,480 tons. The year 1938 established a new record for each crop singly as well as for the two together, the two crops totalling 1,376,535 tons. The total area for the two crops is the smallest since 1930 when the crop was only 1,033,688 tons.

The 1938 rice crop of Korea amounted to 3,385,536 tons, a decrease of 372,802 tons or 9.9 per cent. as compared with the previous year.

French Indo-China.—Entries of padi into Cholon during January and February totalled 383,232 tons, as against 254,367 tons in 1938, an increase of 50.7 per cent. Exports of rice during the same period were 243,017 tons, a decrease of 0.5 per cent. when compared with 244,175 tons in 1938.

Prices of rice and padi rose during January.

Ceylon.—Imports during January and February were 101,053 tons as compared with 88,249 tons in 1938, an increase of 14.5 per cent. Of these imports 14.0 (13.8) per cent. were from British India, 68.9 (76.1) per cent. from Burma, 1.0 (1.1) per cent. from the Straits Settlements and 16.1 (9.0) per cent. from other countries. The 1938 corresponding percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 10th February were 86,368 tons, as compared with 40,298 tons in 1938, an increase of 114.3 per cent. Of these shipments 27.5 (10.9) per cent. were from Burma, 58.3 (74.0) per cent. from Saigon, 14.1 (14.1) per cent. from Siam, and 0.1 (1.0) per cent. from Bengal. The percentages in brackets are for 1938.

Shipments for the Levant from the 1st January to 9th February were 2,231 tons, as compared with 1,040 tons in 1938, an increase of 114.5 per cent. Shipments for Cuba, West Indies and America from 1st to 21st January totalled 3,763 tons, as compared with 9,532 tons in 1938, a decrease of 8.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, JANUARY, 1939.

PRODUCT.	Net Exports in Tons		
	Year 1938	January 1938	January 1939
Arecanuts ...	33,769	3,084	3,710
Coconuts fresh ...	116,743†	5,043†	7,445†
Coconut oil ...	49,140	3,058	4,848
Copra ...	68,754	5,630	640*
Copra cake ...	1,632	181	67
Gambier, all kinds ...	7,112	653	855
Palm kernels ...	9,359	696	998
Palm oil ...	54,377	4,494	3,326
Pineapples, canned ...	73,168	5,631	4,487
Rubber ...	360,898¶	40,024¶	32,574¶
Sago,—flour ...	4,537	39	1,082
„ —pearl ...	4,203	390	187
„ —raw ...	5,088*	499*	206*
Tapioca,—flake ...	981	101	33
„ —flour ...	3,072*	247*	144*
„ —pearl ...	17,818	1,261	1,092
Tuba root ...	676	25	24

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1939	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	2,402.5	2,726.3*	429.7	502.0
February ...	2,193.4	1,693.3	372.9	282.0
Total ...	4,595.9	4,419.6	802.6	784.0
Total January and February, 1938 ...	4,282.1	2,766.3	754.1	493.0
Total for the year 1938 ...	28,979.0	22,087.7	5,158.9	3,620.0

* Revised figure.

Stocks on estates as at 28th February, 1939, were: palm oil 3,382 tons, palm kernels 691 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPALE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 28TH FEBRUARY, 1939.

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FOR THE MONTH ENDING 28TH FEBRUARY, 1900.

STATE OR TERRITORY (1)	ACREAGES OF TAPPALE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)		
	Estimated Acreages of Tappable Rubber (9) + (11) (2)	On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acres (7)	Percent- age of (7) to (2) (8)	Acres (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acres (13)	Percent- age of (13) to (2) (14)
		Acres (3)	Percent- age of (3) to (2) (4)	Acres (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	43,245	834	1.9	16,342	37.8	505	1.2	17,176	39.7	26,069	60.3	7,931	18.3
Malacca ...	121,225	5,379	4.4	33,573	27.7	2,179	1.8	33,952	32.1	82,273	67.9	26,031	21.5
Penang ...	2,480	63	2.5	974	39.3	9	0.4	1,037	41.8	1,443	58.2	60	2.4
Singapore ...	32,013	6,986	21.8	10,014	31.3	135	0.4	17,000	53.1	15,013	46.9	3,401	10.6
Total S.S. ...	198,963	13,262	6.7	60,903	30.6	2,828	1.4	74,165	37.3	124,798	62.7	37,423	18.8
F. M. S.—													
Perak ...	286,251	10,113	3.5	78,815	27.6	8,408	2.9	88,928	31.1	197,323	68.9	49,504	17.3
Selangor ...	321,054	7,272	2.3	69,981	21.8	7,339	2.3	77,253	24.1	243,801	75.9	56,292	17.5
Negri Sembilan ...	256,303	18,953	7.4	65,938	25.7	7,925	3.1	84,891	33.1	171,412	66.9	44,720	17.4
Pahang ...	86,902	7,331	8.4	26,199	30.2	6,787	7.8	33,530	38.6	53,372	61.4	10,365	11.9
Total F.M.S. ...	950,510	43,669	4.6	240,933	25.3	30,459	3.2	284,002	29.9	665,908	70.1	160,881	16.9
U. M. S.—													
Johore ...	482,275	22,806	4.7	137,015	28.4	36,611	7.6	159,821	33.1	322,454	66.9	72,533	15.0
Kedah ...	200,888	9,630	4.8	34,476	17.2	6,974	3.5	41,106	22.0	156,782	78.0	44,862	22.3
Kelantan ...	31,322	403	1.3	7,262	23.2	2,483	7.9	7,965	24.5	23,657	75.5	5,442	17.4
Trengganu (d) ...	4,817	nil	nil	49	1.0	nil	nil	49	1.0	4,768	99.0	1,651	34.3
Perlis (e) ...	1,394	323	23.2	311	22.3	98	7.0	634	45.5	760	54.5	164	11.8
Brunei ...	5,745	nil	nil	2,801	48.8	316	5.5	2,801	48.8	2,944	51.2	570	9.9
Total U.M.S. ...	726,441	33,162	4.6	181,914	25.0	46,482	6.4	215,076	29.6	511,365	70.4	125,222	17.2
Total MALAYA ...	1,875,914	90,093	4.8	483,750	25.8	79,769	4.3	573,843	30.6	1,302,071	69.4	323,526	17.2

... of which, being rested and excludes areas on any

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for quarter ending 31st December, 1938.

MALAYAN RUBBER STATISTICS Table I. **ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.** **FOR THE MONTH OF FEBRUARY, 1939, IN DRY TONS.**

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State or Territory	Stocks at beginning of month 1		Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2	Imports			Exports including re-exports during the month			Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. & Feb. 1939	during the month	From Malay States & Labuan	From Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. & Feb. 1939
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Federated Malay States	...	5,770	26,608	9,421	20,100	2,942	9,281	Nil	Nil	Nil	Nil	10,613	1,299	23,322	4,773	5,374
Johore	...	2,385	9,854	4,214	8,766	2,320	3,895	Nil	35	Nil	68	2,801	3,737	5,855	8,786	2,255
Kedah	...	295	5,820	2,231	4,958	508	1,721	Nil	Nil	Nil	Nil	1,260	1,346	2,539	3,926	231
Perlis	...	...	17	32	10	22	41	Nil	Nil	Nil	Nil	Nil	23	Nil	61	9
Kelantan	...	443	698	333	567	503	1,063	Nil	Nil	Nil	Nil	166	509	402	1,083	593
Trengganu	...	40	292	127	210	207	400	Nil	Nil	Nil	Nil	Nil	327	Nil	611	26
Brunei	...	14	100	37	80	50	131	...	...	...	...	...	83	...	18	18
Total Malay States	...	8,964	43,334	16,373	34,703	6,539	18,532	Nil	35	Nil	68	14,840	7,254	32,120	19,433	8,306
S. SETTLEMENTS:—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malacca	...	1,435	2,345	887	1,915	507	948	Nil	Nil	Nil	Nil	1,825	...	4,678	1,619	2,343
Province Wellesley	...	1,691	1,041	328	742	107	264	Nil	Nil	Nil	19,641	6,748	...	11,331	924	1,053
Penang	2,216	4,152	18	13	31	58	108	3,672	8,551	6,030	...	19,671	...	37,587	1,996	3,618
Singapore	2,923	21,696	304	89	193	65	94	10,168	...	26,792	116	Nil	...	Nil	3,404	19,551
Labuan	...	23	Nil	Nil	Nil	8	18	49	...	...	...	Nil	...	Nil	...	13
Total Straits Settlements	5,139	28,997	3,708	1,317	2,881	745	1,432	13,889	8,551	32,938	19,641	28,244	Nil	54,296	5,400	25,725
Total Malaya	5,159	37,961	47,042	17,690	37,584	7,284	19,964	13,882	8,586	32,938	19,700	43,084	7,254	86,416	19,433	5,400

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	4,720	18,792	3,375	2,350	1,841	133
WET RUBBER	654	759	243	224	414	98
TOTAL	5,374	19,551	3,618	2,574	2,255	231

- Notes:—
- Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 - The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e. Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) - (2) - (3) - (4) - (5) - (9) - (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 - Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 - Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 - All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 - The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd March, 1939.

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. & Feb. 1939
29	30	31
Singapore	28,604	59,407
Penang	10,125	18,778
Port Swettenham	4,050	7,893
Malacca	215	348
Malaya	43,084	86,416

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. & Feb. 1939
32	33	34
Malay States	22,054	51,465
Straits Settlements	1,367	4,196
Malaya	23,421	55,661

METEOROLOGICAL SUMMARY, MALAYA, FEBRUARY, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.					
	Means of		A and B	Absolute Extremes				At 1 foot	At 4 feet	Total.	Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.		
	A.	B.		Min.	Max.	Lowest	Highest					Lowest	Highest	Precipitation .01 in or more	Thunder-storm				Fog morning obs.	Gale force 8 or more
	Max.	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.	mm.	in.	mm.	hrs.	hrs.	Per cent.	
Railway Hill, Kuala Lumpur, Selangor	90.1	70.7	80.4	95	66	82	75	83.0	84.0	4.59	116.6	2.17	9	7	3	2	169.60	6.06	51	
Bukit Jeram, Selangor	89.3	71.2	80.3	92	69	84	73	84.7	85.7	3.89	98.8	3.46	7	5	—	—	216.50	7.73	64	
Sitiawan, Perak	88.9	71.2	80.1	93	64	82	73	83.2	83.7	5.13	130.3	2.40	8	8	—	—	210.50	7.52	63	
Ipoh Aerodrome, Perak	90.7	70.4	80.5	95	63	83	74	82.6	83.3	14.06	357.1	4.20	11	10	—	7	200.35	7.15	60	
Temerloh, Pahang	87.0	70.7	78.9	91	67	80	74	83.6	84.7	1.51	38.4	0.30	13	10	—	8	170.40	6.09	51	
Kuala Lipis, Pahang	85.9	70.2	78.1	89	66	82	73	82.2	83.0	5.70	144.8	2.34	14	10	2	19	133.75	4.78	40	
Kuala Pahang, Pahang	82.9	74.3	78.6	85	70	79	79	81.5	82.9	12.88	327.2	4.13	14	14	—	—	153.15	5.47	45	
Kallang Aerodrome, S'pore	86.7	73.6	80.1	89	71	82	76	81.0	82.3	6.33	160.8	1.87	14	11	1	—	180.30	6.44	53	
Bayan Lepas Aerodrome Penang	87.7	72.0	79.9	92	65	81	74	83.1	83.7	6.76	171.7	4.25	9	6	4	—	219.75	7.85	66	
Malacca Town, Malacca	87.1	72.8	79.9	91	70	80	75	81.3	82.3	2.01	51.1	0.91	9	7	1	—	190.50	6.80	56	
Kluang, Johore	86.3	71.2	78.7	90	69	83	73	79.7	80.8	3.94	100.1	1.17	12	7	2	1	173.45	6.19	51	
Mersing, Johore	82.4	74.3	78.3	86	68	80	77	79.6	79.6	3.57	90.7	1.30	11	9	—	—	170.30	6.08	50	
Alor Star, Kedah	91.8	69.5	80.7	95	65	87	72	84.6	84.6	0.01	0.3	0.01	1	—	1	—	257.00	9.18	77	
Kota Bharu, Kelantan	85.4	70.3	77.9	87	66	83	73	80.6	82.0	0.53	13.3	0.24	7	5	—	1	229.85	8.21	69	
Kuala Trengganu, Trengganu	84.1	71.6	77.9	86	68	81	77	81.1	82.1	2.55	64.8	1.07	12	8	—	3	204.50	7.30	61	
Labuan	83.9	75.7	79.8	87	73	80	78	85.7	86.3	2.84	72.1	1.83	6	5	—	—	187.30	6.69	56	
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	68.6	59.8	64.2	73	57	64	62	69.4	70.1	6.06	153.9	1.62	17	14	—	23	114.65	4.09	34	
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	71.0	54.3	62.7	75	40	67	60	68.2	68.4	4.76	120.9	1.21	14	11	—	3	141.10	5.04	42	
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	71.0	57.0	64.0	76	52	65	59	*	*	4.94	125.5	1.33	13	13	—	—	147.35	5.26	44	

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE
Malayan Agricultural Journal.

MAY, 1939

EDITORIAL.

**Malaya at the
Empire Exhibition.**

With the approval of Government, we publish in this number an abstract of the report of the officer-in-charge of the Malaya Court at the Empire Exhibition held at Glasgow last year. In presenting this account as an abstract, we have omitted only technical details, personal notes, and criticisms designed to assist in the organization of future displays of a like nature.

The Court was in charge of Mr. W. N. Sands, assisted by Mr. F. de la Mare Norris. Both these officers had many years' experience in the Department of Agriculture, Malaya, as well as considerable experience of exhibition work on a large scale. In his report, Mr. Sands acknowledges assistance from many quarters, and without particularizing, we would echo his thanks to those who lent exhibits, to firms and individuals who gave excellent service in matters of transport, technical advice and help, as well as to those who assisted in the assembly of exhibits for which their Department or firm was primarily responsible. The relations between the officials of the Court and the Exhibition authorities and architects were throughout of a very cordial character, and grateful thanks are also due to the authorities for arranging for the accommodation and entertainment during their stay in Glasgow, of five Malay Government officers.

A committee, under the chairmanship of Mr. O. T. Faulkner, at that time Adviser on Agriculture, was formed in Malaya for the purpose of collecting and forwarding to Glasgow the main exhibits. This committee planned the position of the exhibits in the space available, and little departure was found necessary from the general arrangements designed by the committee. The Malayan Information Agency was responsible for the staging and maintenance of the exhibits in the Malaya Court. The Malaya committee decided to limit very strictly the number and variety of exhibits. It was felt that colonial displays at such exhibitions were usually so varied and numerous that the visitor was bewildered and left without any clear impression of the products of the country, or the life of its inhabitants. Consequently, the features stressed were:—export products—tin, rubber and pineapples; transport—rail, air and sea; arts and crafts, selecting only those likely to find a

market in Europe. Whatever criticism may be levelled at the exhibits themselves, or their display, there is no doubt that the exhibits impressed the visitor in the desired way.

Reports from private quarters were unanimous in praise of the Malaya Court, and no little credit for this is due to the Malayan Agency for their excellent organization at the Exhibition.

Certain of the exhibits have since been sent to San Francisco where they will form part of the display in the Johore State Pavilion at the Golden Gate Exhibition. We feel sure that the success attained at the Empire Exhibition will be repeated at San Francisco.

Original Articles.

THE MALAYA COURT, EMPIRE EXHIBITION, GLASGOW, 1938.

The Empire Exhibition was held in Bellahouston Park, Glasgow, from 3rd May to 29th October, 1938. The Park is 150 acres in area and about three miles from the centre of the city. The total number of visitors was 12,593,232; this was a highly satisfactory attendance considering that the weather conditions experienced throughout the period were very unfavourable. The Exhibition buildings were mostly of light construction in modern design and well set out, whilst the general lay-out, decoration and illumination of the grounds were most striking and attractive.

The Site and Building.

The Dominions and Colonial buildings were situated along each side of a broad avenue and facing a large central lake with multi-coloured fountains. This part of the Exhibition, with its flower-beds and water-effects, was very popular with visitors. At the western end of the south side of this avenue was the Colonial Pavilion, which included the Malaya Court. The building was erected by the Exhibition authorities and divided into four parts, namely:—(a) The Colonial Hall, (b) The West Indies, (c) Composite Colonial, (d) Malaya Court.

The Malaya Court, at the back of the Pavilion, was rectangular in shape and measured 84 ft. by 60 ft. There were also two small triangular alcoves in it which were used for the display of handwoven silks, and the Office and Information Bureau respectively. The total superficial area was 5,616 sq. ft.

Interior Construction.

The interior walls, which were of fibre board, were painted a pleasing shade of pale green. The central glass roof was screened with white muslin, which besides hiding the unsightly beams of the roof, formed a useful ceiling without shutting out too much light.

The office accommodation, roughly 16 ft. by 12 ft., was sufficient and proved most convenient for administrative work and interviews. The Information Bureau, 18 ft. by 7 ft., with its bookshelves and counter also served its purpose well.

Suitable platforms and wall-stands, faced with mahogany plywood, were obtained from a local firm of shopfitters, as were also the three large glass showcases for the silk fabrics. For the display of silver, pewter, embroidery, *kris*, *parang*, and small basketry work, six glass cases were hired for the period of the Exhibition. By placing most of the arts and crafts articles in these cases there was no damage done by dust or handling, whilst petty pilfering was prevented.

Above the front and back entrances to the Court, two fascia boards were displayed; these had on them the name "Malaya" in large, raised, red-coloured letters. Where necessary to protect large dioramas and models, stainless steel guard-rails, supported by mahogany posts, were fixed. Besides preventing damage to exhibits they added considerably to the general appearance of the Court.

Interior Decoration.

On the walls, immediately above the stands, large framed photographs illustrating agricultural industries and products, tin-mining, public buildings, local scenery, and Singapore re-housing schemes were hung. Over these were arranged photographs of the Sultans of the different States, whilst surmounting all were the State crests.

Flags of the Colony and of all the States were hung around the central hall of the Court.

Three large framed maps of Malaya were placed on the walls near to the office and main entrance, namely, a large general, an aviation, and a geological map. The maps were those published and supplied by the Survey Department, S.S. and F.M.S.

Lighting.

The main lamps and supply of electric current to them were provided by the Exhibition authorities, but the lamps for lighting stands, models, dioramas, show-cases and office were installed according to requirements, as were also the separate meters, switches and wiring.

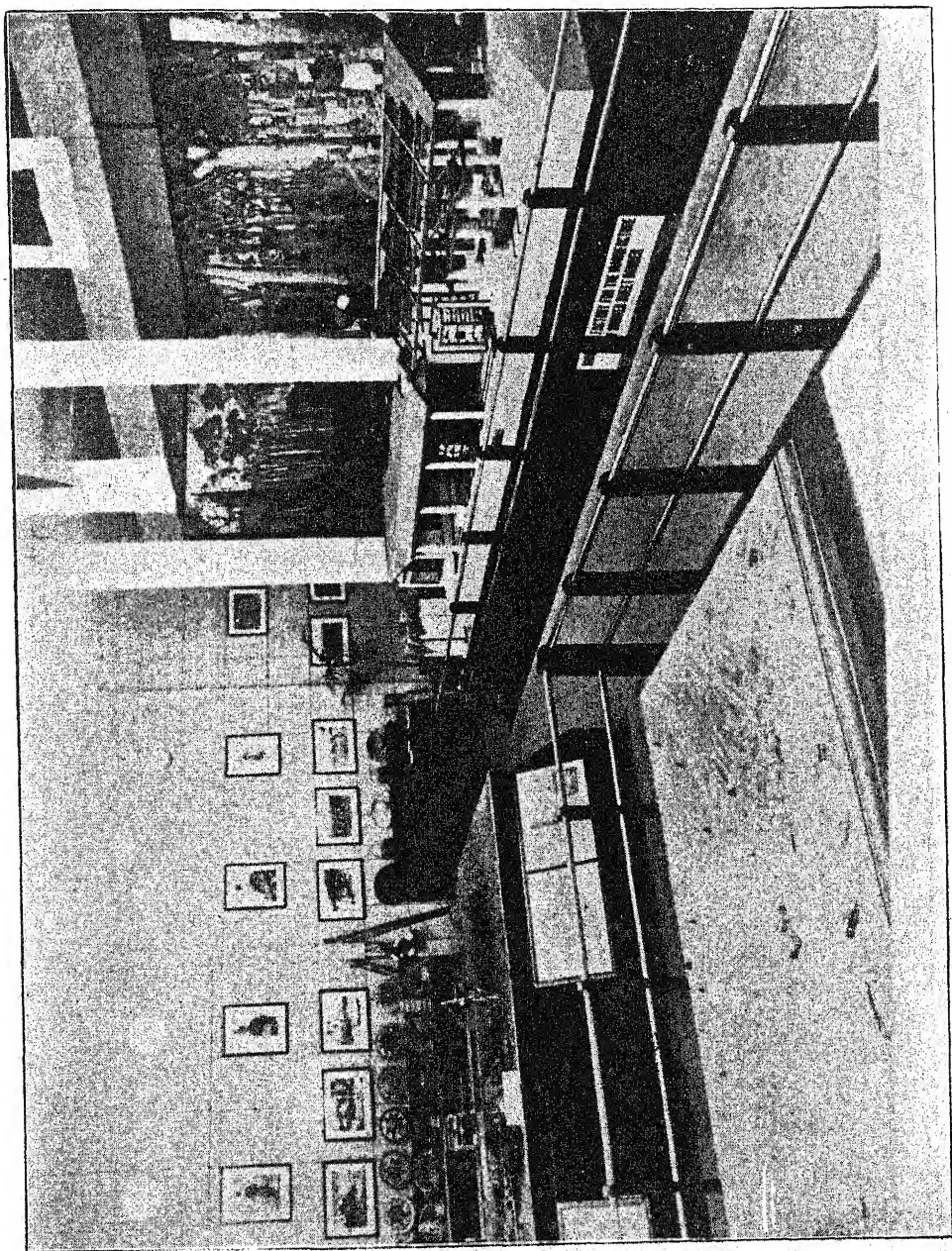
The general lighting of the Court by large white globe lamps was on the whole satisfactory, but towards the close of the Exhibition, when dust had collected on the muslin ceiling under the roof lamps, its effectiveness was considerably reduced.

Lay-Out.

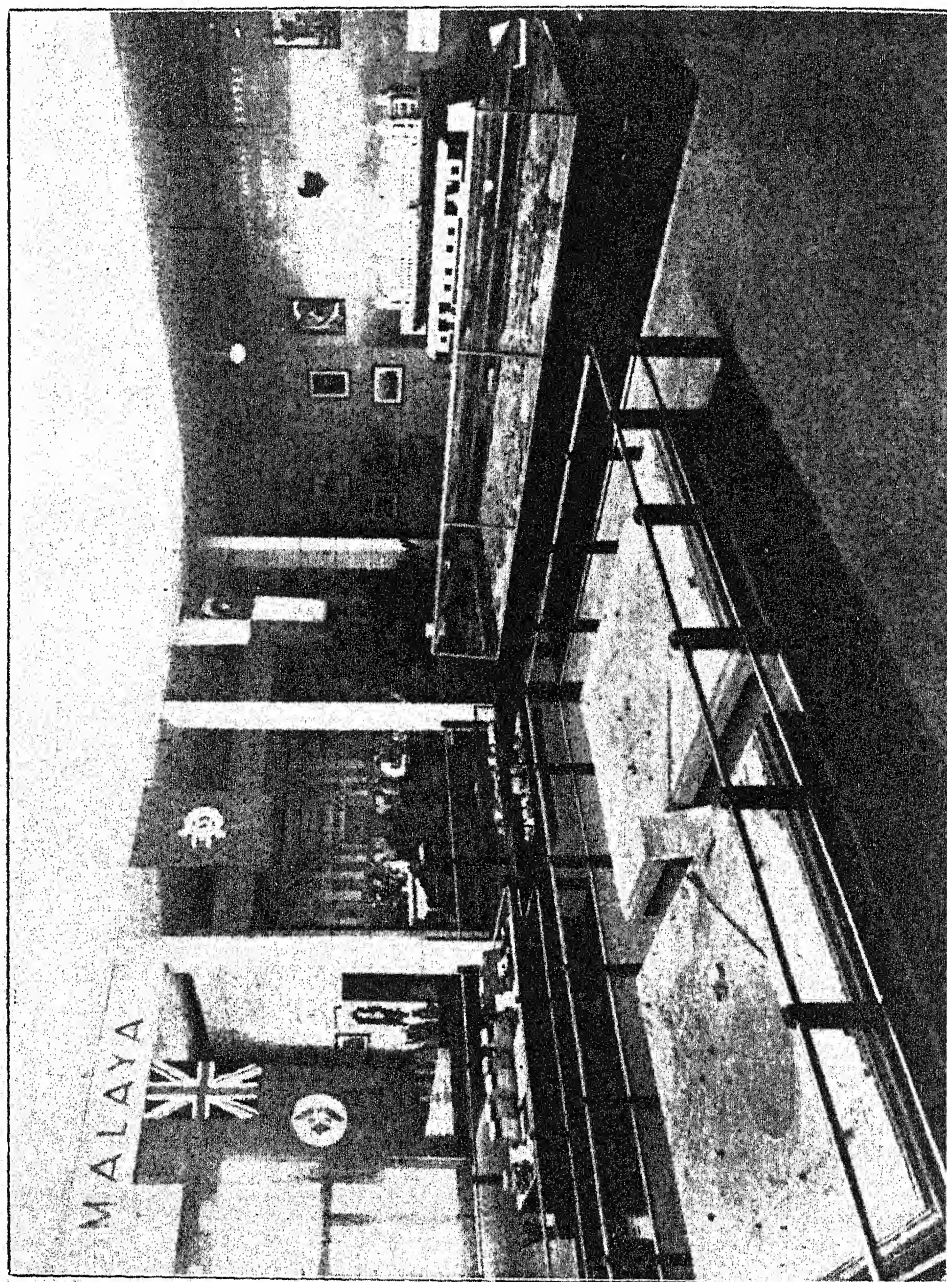
The arrangement of the large models on the floor space, so that they might be shown to the best advantage, required much consideration and several modifications of the original proposals from Malaya were necessary so as to obtain a clear and unobstructed view of the whole Court and to provide ample gangway space for the circulation of the crowds of visitors. That the final arrangement was eminently satisfactory was evidenced by the favourable comments which were received from visitors, many of whom considered the lay-out and decoration of the Court were among the best in the Exhibition.

The central floor space at its western end was occupied by the large Federated Malay States Railways exhibit. In front of this was the model of the Singapore Harbour. In the centre were two models of the new Singapore Civil Airport, and beyond these a working model of a tin dredge in an iron tank. At the eastern side and opposite the dredge, were a weaving diorama and a stand containing miscellaneous articles of native work.

At the northern side, and left of the front entrance, were the office and information bureau, and stands with baskets, hats, embroidery, *kris*, *parang*, boats, blow-pipes and gongs. At the right of the entrance there was a furnished boudoir, 26 ft. by 8 ft. with show-cases for the display of handwoven silks. Beyond the boudoir was a stand containing a diorama of a coconut plantation, coconut and oil palm products, together with models of the fruit-bunches of each palm.



Malaya Court, Empire Exhibition, 1938.
Diorama of Rubber Estate and Model Rubber Factory on the right.



Malaya Court, Empire Exhibition, 1938.
Pineapple Diorama in centre background.

The Court had a raised floor at the back, 84 ft. by 24 ft. and 18 ins. high. In front and below this were staged glass-cases containing Kelantan and Brunei silverware and pewter; a stand with exhibits of Malayan tea; and a large model of a modern rubber factory.

On the raised floor at each end were placed two large dioramas representing (a) a rubber plantation and (b) a pineapple factory, whilst on stands on each side of the gangway leading to the back entrance were, at left, a model of the Brunei oil-field and, at right, a small diorama of a pineapple plantation and an extensive collection of tinned pineapples of different brands.

Considerable attention was devoted to large and small descriptive labels of the exhibits. Each model, diorama, or group of articles, was fully described and explained. The labels were much appreciated by visitors who at once obtained most of the information they desired without taking up the time of the staff.

Agriculture.

Rubber. The industry was represented by two striking exhibits (a) a diorama of a rubber plantation and (b) a scale model of a rubber factory.

The large diorama at the back of the Court was 30 ft. by 15 ft. by 12 ft. and showed a typical scene on a rubber estate with four life-size figures of Indian labourers tapping and transporting latex. There were five real rubber tree trunks each 11 ft. high, one of which was adapted to give a representation of latex flowing from the tapped bark into a cup. The realistic and beautifully painted back and one side canvases depicted portions of a mature rubber plantation whilst the other side canvas showed virgin jungle. The diorama was effectively lighted by means of fifteen 200 Georçay reflectors. It can be safely stated that this exhibit was one of the most attractive to visitors in the Exhibition, besides being of considerable educational value.

The excellent model rubber factory, 20 ft. by 5 ft., was placed below and in front of the rubber diorama. It showed, to one-eighth actual size, the structure and arrangement of a modern factory for producing smoked sheet rubber. It demonstrated the method of conveyance of latex from the field; the bulking and coagulating tanks; sheeting battery method of transporting the sheets on trolleys from the rollers to and through the divisions of the smoke house; the furnace and flues and packing shed; whilst cases and samples of smoked sheet ready for shipment were placed at the end of the stand. The method of preparing smoked sheet from latex was fully described on a large label in the centre of the exhibit. The model attracted much attention and like the rubber diorama was very instructive.

Pineapples. The pineapple exhibits occupied a prominent position in the Court; they comprised a 30 ft. by 15 ft. by 12 ft. diorama of a pineapple canning factory, a small diorama of a pineapple plantation, and canned pineapple products.

The large diorama depicted the interior of a factory in the State of Johore. There were two life-size figures of Chinese operatives, wearing white shirts and rubber gloves, sitting at tables preparing slices and cubes of pineapples. There were

also baskets of model fruit, cases of canned fruit and other articles. The back canvas showed a number of Chinese at work in the factory. One side canvas illustrated the machinery and work of the canning room, and the other, Chinese labourers shipping cases of canned pineapples. Like the rubber diorama the whole was well lighted by means of fifteen 200 Georcy reflectors. The diorama evoked a considerable amount of interest and was the means of bringing to the notice of hundreds of thousands of people the conditions under which the fruit is prepared for market in Malaya and the importance of the local industry.

On a wall-stand, 12 ft. by 6ft., adjoining the large diorama was a small diorama of a pineapple plantation showing plants in fruit; this was a very useful addition to the stand as so many people appeared to think that the fruit grew on trees.

Many well-known brands of canned slices and cubes were arranged in groups in front of the diorama. Two of the, as yet, lesser known products were small cubes, termed "Dolly Cubes" and pineapple juice named "Pinex." Among the business inquiries were several concerning these products.

Other Canned Fruit. A Penang firm sent for exhibition a small number of tins of canned rambutan, mangosteen pulp, mangosteen juice and young coconut pulp. The products were a constant source of interest and inquiry by visitors who wished to purchase and taste them.

Tea. Attention was called to the production of tea in Malaya by means of well prepared samples and packets of locally manufactured brands. The exhibits consisted of large samples in chests of the following grades of tea: Broken Orange Pekoe, Orange Pekoe, Pekoe, Fannings and Dust. Around the chests were placed attractive 1 lb. packets of the produce of four plantations.

Many inquiries were made as to where the different kinds of tea could be obtained in the United Kingdom.

Cutch. A small exhibit of this valuable tanning substance, derived from mangrove bark in the State of Brunei, was exhibited. It consisted of small boxes and bags of the extract, together with samples of leather and fishing nets tanned and preserved with it.

Coconut and Oil Palms. Although the extensive coconut and oil-palm industries were not originally intended to be represented, it was found possible to include exhibits of these from Malaya House and so add considerably to the interest and value of the display as a whole. The exhibits of the coconut industry were a small, but very realistic, diorama of a coconut plantation near the coast, a model of a bunch of coconuts, unhusked and husked nuts, copra, coconut oil and coconut charcoal. The oil palm exhibits included a model of a full-size bunch of fruit, palm oil and palm kernels. Large photographs of both coconut and oil palm plantations were placed on the wall above the exhibits. The stand with these exhibits was most popular and it was nearly always thronged with visitors.

Photographs. As it was not possible to deal adequately with many other crops produced in Malaya, several of these, namely, rice, spices, arecanut, tapioca and fruits, were illustrated by means of a large collection of excellent photographs.

Tin Mining and Oil Production.

Tin Dredge. It was originally intended that the tin mining industry should be represented by two large working models of a tin dredge and an open-cast mine respectively. Owing, however, to difficulties experienced in Malaya in obtaining a suitable model of the latter, only the working model of a modern tin dredger was available: this was exhibited by the London Tin Corporation. The whole exhibit, with its mahogany surround, occupied a space of 15 ft. 6 ins. by 9 ft. 6 ins. The dredge was situated in the centre of the tank which was filled with muddy water. Two small electric motors supplied power for driving the bucket-chain and the revolving screen. Around the outside of the tank were fixed splendid photographs of tin-dredgers at work and methods of recovering the ore. The dredge itself was a finely made model of one of the latest types in operation in Malaya.

Along the sides at the top of the tank was a rough grass border to represent undredged ground and on this were placed suitable descriptive labels and specimens of tin-ore. A leaflet giving details of the operation of the dredge was freely distributed.

This outstanding and instructive exhibit was always a centre of interest to visitors.

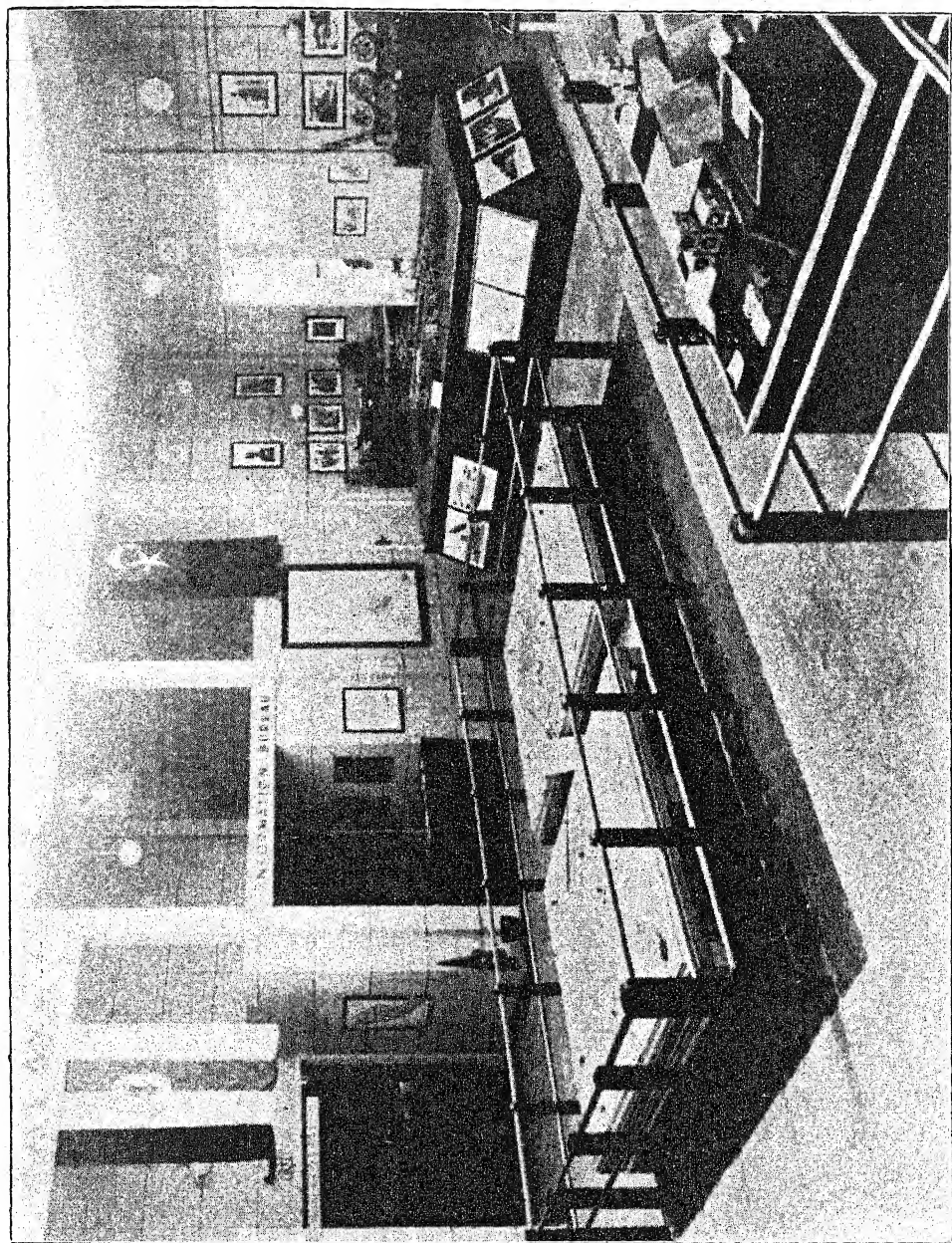
It was unfortunate that other Malayan methods of tin mining; specimens of tin in various forms, as well as the many uses to which the metal is put, could not have been demonstrated, but exigencies of space prevented this. There were, however, large photographs of other methods than dredging shown, such as an open cast, and gravel pump, mines.

Oil Production. The important mineral oil industry of Brunei was brought prominently to public notice by means of excellent scale models of a production block and an imaginary section of the local strata with pipe and casing leading to the source of oil. There were also samples of the different grades of oil produced and photographs of the field. The production block consisted of a painted background showing the jungle-covered country with roads and derricks and, in the foreground, separators, field collecting and storage tanks. The whole exhibit, with its descriptive labels, was particularly interesting and instructive.

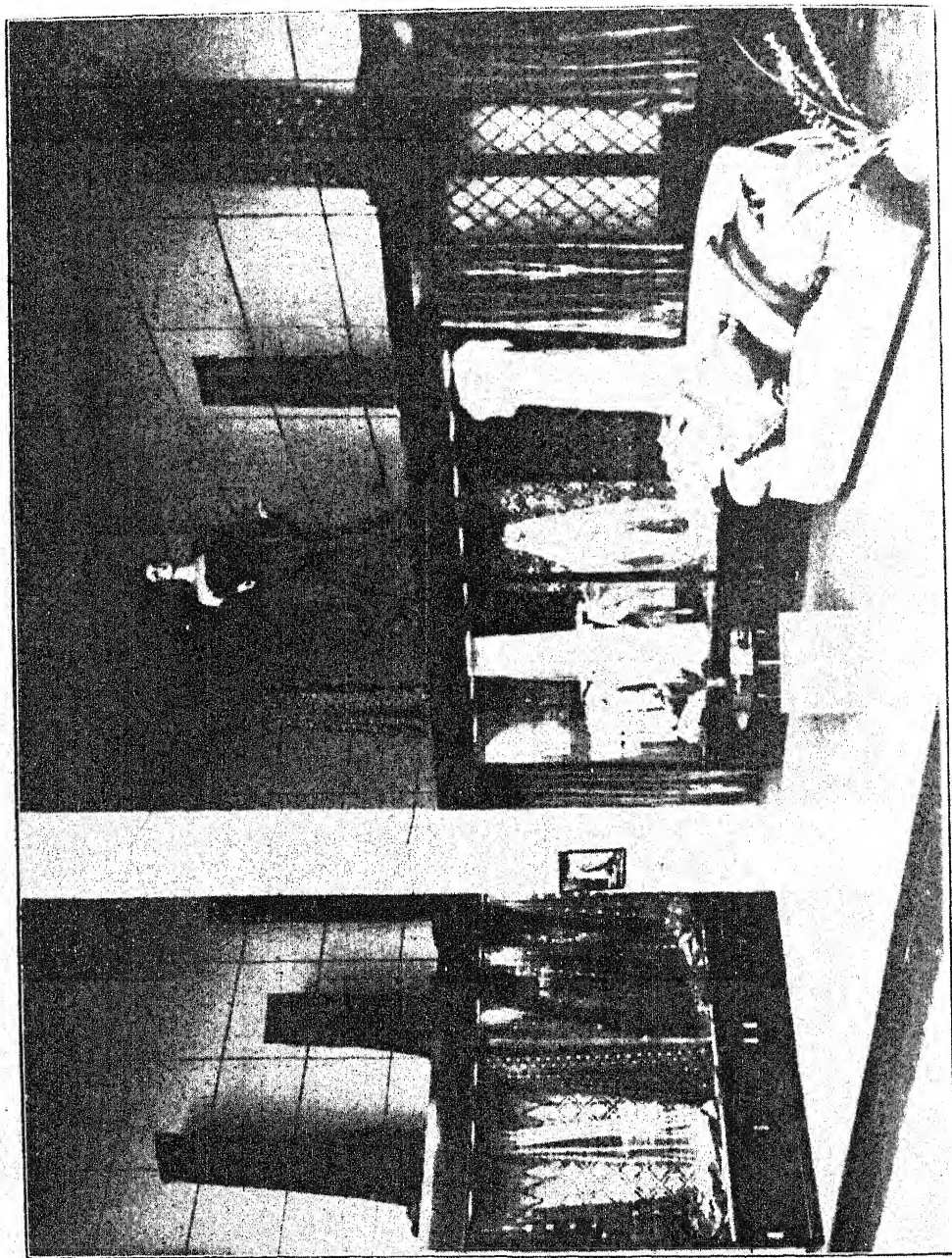
Arts and Crafts.

The arts and crafts sections were well represented by excellent collections of articles of Malayan craftsmanship. They may be classified as under:—

- (a) Silver, pewter and brass
- (b) Basketry
- (c) Walking sticks
- (d) *Parang* and *kris*
- (e) Embroidery
- (f) Boats and blowpipes
- (g) Miscellaneous.



Malaya Court, Empire Exhibition, 1938.



Malaya Court, Empire Exhibition, 1938.
Display of Malayan Silk Fabrics.

The sticks were staged in specially made stands on each side of the counter of the Information Bureau, and, contrary to expectation, all were sold, except five defective ones.

(d) *Kris and Parang.*

The State of Perlis sent a set of six beautifully made small *kris*, three of which were mounted in ivory, while seven representative specimens were borrowed from a private collection. The above examples of this Malayan weapon were always of interest to visitors as were also the twelve *parang*, with their carved sheaths, from different States. Souvenir hunters purchased all of the *parang* and two of the lower-priced *kris*.

(e) *Gold Embroidery.*

In a separate glass case were displayed the following finely worked examples of gold-thread embroidery. From Perak came two cushion covers with the name "Sultan of Perak" in a circular design, and from Selangor, eleven white and eleven black small ladies' handbags, two velvet cushions, six shoe-tops, one pair of shoes and one pair of fans; whilst Pahang sent two velvet cushions. The exhibits, more particularly the handbags and the shoe-tops, attracted considerable attention, the latter leading to an inquiry from a firm of slipper makers regarding Malayan suppliers of the articles.

(f) *Boats and Blowpipes.*

The large well-built model of a fishing boat from Teluk Anson, with its mast, sail and numerous small appliances used in fishing in Malayan waters, was particularly attractive to persons interested in sailing and fishing. The two small boats from Pahang were also good models of their kind.

The six blowpipes with their quivers of poisoned darts were always popular and frequent explanations concerning the method of using them were necessary.

(g) *Miscellaneous.*

Specimens of novel, wooden, coloured flowers and foliage were sent from Singapore and were used for decorative purposes in the Silks Bureau.

There were other small arts and crafts exhibits, such as an elephant modelled in beeswax, carved wood, and six pieces of pottery in artistic designs from Tanjong Malim.

Other Exhibits.

Stamps. A collection of current issues of Malayan stamps from the Colony and each of the States was exhibited in a large glass frame near to the Information Bureau. The stamps proved of great interest and constant inquiries were made as to whether specimens could be purchased in the Court, or where obtainable.

Maps. Besides three large framed wall maps of Malaya, there were a number of the Colony, States, chief towns and hill-stations available for reference purposes, and particularly good use was made of them.

Pictures. Three excellent framed pictures of Malay life were loaned and hung in the Court. The paintings were highly praised. Reproductions of four pictures were also sent by the Agency so that those interested might obtain copies of them if they so desired.

Hand Weaving of Silk. The hand-weaving of silk fabrics was illustrated by means of a realistic and beautiful diorama measuring 12 ft. by 9 ft. Owing to delays in Malaya, it was not staged until 7th August, or three months after the opening of the Exhibition. The diorama depicted, at left, a Malay woman sitting on the verandah of a house, engaged in weaving on a real, primitive, handloom a piece of silk fabric with a gold-thread design, whilst another woman seated on the floor, at right, was winding bobbins. The back canvas showed a typical village with boys playing the basket-ball game, known as *sepak raga*, on the seashore, whilst on one side canvas was a typical coastal scene with fishing boats and on the other a rice field. The whole was covered with a real atap roof. The diorama was one of the most attractive in the Court and by general consent it and the rubber one were considered to be the finest of their kind in the Exhibition.

Silk Fabrics. Silk fabrics from Trengganu, Kelantan and Johore, of varying types from the heavy and elaborate gold-thread fabrics to the plain and mastuli silks, formed a prominent exhibit. A well-known London firm designed and made five striking dresses which were exhibited at the fashion parades in the Fashion Theatre at the Exhibition after being displayed in London.

The main purpose of the exhibit was to create a market for these fabrics. An agent was appointed for this purpose and a lady previously connected with British Industries House was in charge of the display at Glasgow. Valuable trade connexions were made and it was found that a potentially large market existed for the plain shot silks which could be sold at a reasonably low price. Unfortunately the resources of the industry in Malaya were not sufficiently developed to deal expeditiously with the trial orders that were forwarded and it is feared that the opportunity has been lost because guarantee of date of delivery is one of the most important factors necessary in order to secure and maintain trade.

The exhibit at Glasgow was well staged and created a great deal of interest, practically all the lower priced material being sold.

There is definitely not sufficient demand for the expensive gold-thread fabrics to warrant further attempts to exploit them, but the plain shot silks for dresses and the mastuli for furnishings did offer possibilities.

Transport.

Transport in Malaya was well represented by large models, photographs and posters sent by (a) the Federated Malay States Railways, (b) the Singapore Harbour Board, and (c) the Public Works Department.

Railways.

The Federated Malay States Railways exhibit occupied an area of 18 ft. by 10 ft. It consisted of two very fine models, namely the Central Railway Offices in Kuala Lumpur and a first-class day and night air-conditioned coach. The coach

was constructed by the staff of the Central Workshops of the Railways and was an excellent example of local craftsmanship. On a tall wooden, coloured, background were hung photographs of prominent railway buildings and coloured posters, and on stands on the platform were placed a map of the railways and further photographs.

The buildings and up-to-date equipment of the railways shown made a special appeal to visitors.

Singapore Harbour.

The splendid model of Singapore Harbour with its buildings, wharves and docks shown in detail, occupied a space of 19 ft. by 8 ft. by 6 ins. When staged it was completely repainted and a new plate-glass sloping cover erected over it. A number of beautifully made model liners and other craft were afterwards placed at the wharves and in the docks. In order to locate particular buildings, docks and other prominent features of the model, a series of electric buttons, placed around the exhibit, when pressed indicated by means of small lights the position of the place desired. This striking model was staged and reconditioned under the direction of an officer of the Singapore Harbour Board, who also had printed for distribution coloured leaflets describing the Harbour and giving the names and positions of the different ships shown as models. The exhibit was so popular that it was nearly always thronged with visitors.

Singapore Civil Air Port.

This was represented by two fine models, one showing in detail the site of the Air Port as it was in 1931, and before 262 acres of the tidal swamp were reclaimed, and the other, the circular landing ground, terminal buildings and hangars, also the dredged sea-plane channel protected by booms and the slipway adjacent to the landing ground. The models with their surrounding barrier occupied a space of 14 ft. by 10 ft. An officer of the Public Works Department paid two visits to advise in regard to the siting and staging of the models which, with their map showing the position of the Air Port in relation to the town of Singapore and the descriptive labels, were always popular besides being instructive.

Propaganda.

Public attention was drawn to Malaya by the showing in the Exhibition Cinemas of three films, namely: "Five Faces of Malaya," "Copra" and "Rice." The first was shown at intervals in the Empire Cinema, whilst the two latter were shown in the Cinema of the Scottish Pavilion, and the "Copra" once in the East African Cinema in connexion with a lecture on "Coconut and Coconut Products" given on the 4th October by Mr. W. N. Sands.

The films, which were highly praised, were seen by a very large number of people.

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The splendid model of Singapore Harbour with its buildings, wharves and docks shown in detail, occupied a space of 19 ft. by 8 ft. by 6 ins. When staged it was completely repainted and a new plate-glass sloping cover erected over it. A number of beautifully made model liners and other craft were afterwards placed at the wharves and in the docks. In order to locate particular buildings, docks and other prominent features of the model, a series of electric buttons, placed around the exhibit, when pressed indicated by means of small lights the position of the place desired. This striking model was staged and reconditioned under the direction of an officer of the Singapore Harbour Board, who also had printed for distribution coloured leaflets describing the Harbour and giving the names and positions of the different ships shown as models. The exhibit was so popular that it was nearly always thronged with visitors.

Singapore Civil Air Port.

This was represented by two fine models, one showing in detail the site of the Air Port as it was in 1931, and before 262 acres of the tidal swamp were reclaimed, and the other, the circular landing ground, terminal buildings and hangars, also the dredged sea-plane channel protected by booms and the slipway adjacent to the landing ground. The models with their surrounding barrier occupied a space of 14 ft. by 10ft. An officer of the Public Works Department paid two visits to advise in regard to the siting and staging of the models which, with their map showing the position of the Air Port in relation to the town of Singapore and the descriptive labels, were always popular besides being instructive.

Propaganda.

Public attention was drawn to Malaya by the showing in the Exhibition Cinemas of three films, namely: "Five Faces of Malaya," "Copra" and "Rice." The first was shown at intervals in the Empire Cinema, whilst the two latter were shown in the Cinema of the Scottish Pavilion, and the "Copra" once in the East African Cinema in connexion with a lecture on "Coconut and Coconut Products" given on the 4th October by Mr. W. N. Sands.

The films, which were highly praised, were seen by a very large number of people.

On the 18th October Mr. F. de la Mare Norris read a paper on "Tropical Fruit," with special reference to Malayan pineapples, in the Congress Hall of the Exhibition, and on the 4th November Mr. Sands broadcast a twenty-minutes talk to schools on "Rubber Planting in Malaya" on the B.B.C. Scottish Regional Programme.

The local press was kept constantly informed of items of interest concerning the Court throughout the period of the Exhibition.

Publications.

The office library was supplied with a selection of useful reference books and publications loaned from Malaya House and the Incorporated Society of Planters. Among those to which frequent reference was made were:—A Dictionary of the Economic Products of the Malay Peninsula, Rubber Planting, An Outline of Malayan Agriculture, Mining in Malaya, and the Colonizer. The publishers of the periodical "British Malaya" also kindly supplied twelve monthly copies of the journal as issued.

The booklets and pamphlets distributed free to visitors were:—

A Brief Introduction to Malaya	...	...	150,000 copies
Rubber	...	...	17,000 "
Pineapples	...	...	19,000 "
Visit Malaya	...	...	550 "
Come to Malaya	...	...	120 "
Pineapple Recipes	...	...	Several thousand
Penang Information Guide	...	...	144 copies
Singapore Harbour Board	...	...	42,000 "
Working of Tin Dredge	...	...	Several thousand

The demand for the literature was satisfactory.

The publications offered for sale were:—

Handbook to British Malaya
Penang View Album
Willis' Guide to Singapore.

As was the experience at the Wembley Exhibition, there was little demand for priced books and sales were disappointing; this was no doubt due to the fact that throughout the Exhibition there was an abundance of free literature available.

MALAYAN AGRICULTURAL TRADE IN 1938

BY
D. H. GRIST,
Agricultural Economist.

Prices.

The review of Malayan agricultural trade in 1937* recorded improvement in market prices of practically all the agricultural products of Malaya. Prices, which were sharply on the up-grade during the latter part of 1936, continued to improve during the first half of 1937, but during the latter half of that year there was a retrograde movement and the year ended with prospects far less encouraging than they were earlier in the year.

Prices of all commodities in 1938 failed to recover from the low prices recorded for the second half of the previous year, while for many agricultural products the market showed a further steady decline during the year under review. This was most marked in the following export industries:—copra, oil palm products, pine-apples, sago, tapioca, and derris, as is seen by the comparisons given in Table I.

Table I.
Comparative Prices in 1937 and 1938
of certain Agricultural Products for Export.

Average Price	Copra Sundried per picul	Palm Oil per ton	Palm Kernels per ton	Pine- apples per case	Sago per picul	Tapioca per picul	Derris per picul
	\$	£ s. d.	£ s. d.	\$	\$	\$	\$
Jan.-June 1937 ...	7.61	25 9 2	14 8 11	3.08	5.45	5.86	47.00
July-Dec. 1937 ...	5.30	19 5 9	10 19 10	2.97	5.03	5.15	34.00
Jan.-June 1938 ...	3.38	14 18 8	9 8 11	2.68	3.90	4.24	23.67
July-Dec. 1938 ...	3.30	13 9 0	8 7 11	2.89	3.67	4.08	19.67

The average annual prices of the more important agricultural products are given in Table II, which further emphasises the 1938 depression.

The position of industries subject to some form of control is to be noted. Rubber, subject to International Rubber Regulation, cannot be said to have experienced a satisfactory year. The severity of restriction in this industry militates against low costs of production, while the burden of maintaining large untapped areas further raises costs.

* *Malayan Agricultural Journal*, Vol. XXVI, No. 5, 1938.

Table II.
Average Annual Market Prices in Singapore of Agricultural Products.

Year	Rubber per lb.	Copra per picul	Coconut Oil per picul	Palm Kernels per ton	Palm Oil per ton	Gambier per picul	Sago per picul	Tapioca per picul	Nutmegs per picul	Pepper per picul	Are- canuts per picul	Pine- apples per case
	cents	\$	\$	£ s. d.	£ s. d.	\$	\$	\$	\$	\$	\$	\$
1929	34.63	9.45	16.69	28 6 3	18 4 3	14.69	7.98	6.27	46.60	57.31	9.10	
1930	19.15	7.81	14.35	23 7 2	13 5 5	15.30	6.56	4.73	31.03	33.56	8.95	
1931	9.82	5.09	9.69	18 18 3	10 7 7	17.39	5.01	3.59	23.02	20.39	6.75	
1932	6.97	5.74	10.04	17 18 9	11 1 3	14.83	4.25	3.23	24.78	20.44	5.62	3.34
1933	10.21	3.90	7.70	16 0 3	8 16 4	7.70	4.17	4.35	20.50	14.49	6.50	3.11
1934	20.63	2.94	5.96	12 9 3	6 12 8	7.76	3.92	4.13	23.41	16.33	6.50	3.10
1935	20.35	4.54	9.13	19 19 8	8 13 9	10.53	3.86	4.38	29.40	12.37	6.74	3.47
1936	27.04	5.81	11.96	19 18 2	11 0 11	10.30	4.10	5.50	29.62	8.36	6.83	3.29
1937	32.09	6.45	11.13	22 3 4	12 14 5	15.71	5.24	5.15	34.77	9.91	7.71	3.02
1938	24.39	3.53	7.53	14 3 10	8 19 3	15.34	3.78	3.16	31.15	8.24	7.64	2.79

Tea production in Malaya, subject to the International Tea Agreement, made progress, and the price in the open market, undoubtedly the result of restrictive measures, enabled producers to make a fair profit.

The Malayan pineapple canning industry experienced a trying year, but the measure of control of production and sales made possible by the formation during the year of a Central Board of Pineapple Packers has already resulted in improved market conditions.

The other crops grown in Malaya compete with similar products in an open and unrestricted market, and in the absence of well organized control of production and marketing it is unlikely that any improvement may be expected while international trade is affected by political uncertainties as are now being experienced.

Crop Production.

The crops considered under Malayan agricultural trade may be conveniently considered under three heads—crops for internal consumption, export products, and the preparation for market of products from neighbouring countries. The crops included in this review are those grown in Malaya and also crops which at least theoretically, although perhaps not economically, might be grown in this country. For instance castor oil, which cannot be grown economically in Malaya, is included, while wheat, a temperate climate crop is excluded.

Crops for Local Consumption.

The chief crop under this heading is rice; vegetables, fruits, coffee and tobacco are also grown entirely for local consumption. In addition, there are crops grown for local markets, the surplus being exported. Chief amongst such crops are coconut products and arecanuts. With the exception of rice, for which reasonably accurate figures of production and consumption are available, the total yield and local consumption of the other products mentioned above are not known with any degree of accuracy.

The production of rice in Malaya in the 1937-38 season amounted to 299,190 tons from an area of 726,670 acres. Both area and yield were below those recorded for the previous year, due mainly to an unfavourable season. The price paid for padi at mills was higher than during 1937, while the market price of rice was lower. The lower price of rice was particularly welcome to those engaged in agricultural pursuits who suffered from the lower prices obtained for their produce.

Local production supplied only 33 per cent. of rice requirements, net imports amounting to 612,394 tons. Total consumption of rice was 911,584 tons, as compared with 892,297 tons in 1937, and was the largest on record.

The value of Malayan production of rice in 1938, based on the average wholesale price of Rangoon rice in Singapore, was \$18,800,000, or \$2,200,000 less than in 1937.

Vegetables and fruits are grown in large quantities, the demand being further satisfied by large imports from neighbouring countries. Vegetable cultivation is almost entirely in the hands of the Chinese, but Malays are mostly responsible for the fruits. There is a growing realization amongst both Malays and Chinese of the profits which may be obtained from fruit cultivation. Interest in improved planting material and greater care in cultivation are evident.

Locally-grown coffee finds a ready market in Malaya, and is retailed in tins either as a Malayan coffee or blended with imported coffee.

Tobacco cultivation continues to be a popular crop in certain districts. The leaf, though of indifferent quality, finds a steady market at a remunerative price to the producer. It is used mainly for the manufacture of very cheap cheroots for sale amongst the labouring classes.

Export Crops.

The principal export crops are rubber, coconut products, canned pineapples, oil palm products and arecanuts. Amongst other export crops are tea, tapioca, sago, gambier, derris, and spices.

Rubber.—The production of rubber in 1938 totalled 360,898 tons, as compared with 503,127 tons in 1937; 512 tons were consumed locally by manufacturers of rubber goods.

The production of rubber was restricted under the terms of the International Rubber Regulation Agreement. Malaya's quota was 602,000 tons, the average release for the year being but 55 per cent. of the quota. The area of small holdings out of tapping increased steadily, owners finding it as profitable to sell their coupons as to produce rubber owing to the narrow margin between the price of rubber coupons and that of couponed rubber.

Coconut Products.—Net exports of copra were 68,754 tons, coconut oil 49,140 tons, fresh coconuts 8,350 tons. The copra equivalent of these exports was 150,944 tons, as compared with 142,110 tons copra equivalent in 1937. Copra exports declined in 1938, but exports of oil increased. The total value of net exports of coconut products was \$11,750,000 as compared with \$17,760,000 in 1937.

The difficulties which confronted producers of oil palm and coconut products were realized by Government, and the reduction of quit rent and the removal of export duty on copra and coconuts continued in force.

Oil Palm Products.—Exports of palm oil increased by over 4,000 tons to a total of 54,377 tons, and palm kernels by 2,000 tons to a total of 9,359 tons. The increased exports are on account of new areas coming into bearing and natural increase in mature areas. While exports increased in quantity their value decreased, being \$6,752,000 as compared with \$7,120,000 in 1937.

Pineapples.—Reference has already been made to the introduction of control within the canned pineapple industry. In the first half of the year large stocks accumulated both in Malaya and in consuming countries. Prices were accordingly depressed, a position rendered more acute by competition between local canners. A Central Board of Pineapple Canners was formed in October with the object of controlling production and selling price, and there is every hope that the Board may achieve its objects and bring a return of reasonable prosperity to the industry.

The area under pineapples decreased. Exports of canned pineapples amounted to 73,169 tons as compared with the record figure in 1938 of 80,504 tons; 1938 exports were valued at approximately \$7,263,000 or \$1,563,000 less than in 1937.

Tea.—A detailed report of the Malayan Tea Industry in 1938 was given in the last number of the *Malayan Agricultural Journal*. Total production was estimated to have been 1,467,000 lbs., of which 684,624 lbs. were sold locally. Net imports of tea were 3,465,900 lbs., and total consumption in Malaya was 4,150,540 lbs.

Satisfactory prices were realized on the London market for Malayan grown tea, 747,303 lbs. being sold at prices which compared favourably with those obtained for tea from countries with similar tea-growing conditions.

Arecanuts.—Net exports at 33,769 tons showed an increase over the previous year of 3,685 tons, while in value 1938 net exports were \$504,253 greater than in 1937. Thus, while prices in the year under review were lower than the previous year, the expansion of the industry compensated for decreased values.

The remainder of the export crops call for little comment; tapioca net exports decreased slightly, while sago net exports fell from 10,981 tons in 1937 to 3,652 tons in 1938. Gambier exports and values continued to decline. The derris market was uncertain and prices militated against the expansion of the cultivation of this crop.

Trade in Principal Export Products.

Table III shows the trade in the chief products and also the value of the entrepôt trade, especially in rubber, coconut products, arecanuts, sago and pepper. Much of this trade is concerned in the conditioning and grading of the products to render them suitable for the world's markets. This trade declined in comparison with the previous year, due in large measure to the general unsatisfactory trade conditions.

In the case of rubber the decrease is due to the much smaller amount of wet rubber now imported into Singapore from the Netherlands Indies for the manufacture of sheet rubber. Formerly, this was a thriving industry in Singapore but now the bulk of this native rubber is conditioned in the country of origin.

Table III.
Imports and Exports of certain Agricultural Products 1938.

Product	Imports		Exports		Net Exports	
	Tons	Value \$	Tons	Value \$	Tons	Value \$
Rubber	156,101	74,330,170	526,911	272,980,376	370,810	198,650,206
Coconut Products	118,662	6,902,842	243,667	18,418,085	125,005	11,515,243
Pineapples	1	407	73,169	7,262,851	73,168	7,262,444
Oil Palm Products	163	18,700	63,899	6,769,890	63,736	6,751,198
Arecanuts	55,420	5,607,979	89,189	10,445,751	33,769	4,837,772
Tapioca	8,143	531,436	23,869	1,608,096	15,726	1,076,660
Sago	46,059	1,592,853	49,711	2,578,422	3,652	985,569
Gambier	2,393	467,829	4,026	882,237	1,633	414,408
Derris	88	31,988	764	338,789	676	306,801
Pepper	8,003	1,494,790	7,627	1,534,674	— 376	+ 39,884

— Excess of imports over exports.

Table IV.
Annual Net Imports and Exports of Agricultural Products, Malaya.

Year.	Net Imports*		Net Exports† (excluding rubber)		Excess of Imports over Exports (excluding rubber)		Net Exports of Rubber		Excess of Total Imports over Exports		Excess Value of Exports over Value of Imports	
	Quantity Tons	Value \$	Quantity Tons	Value \$	Quantity Tons	Value \$	Quantity Tons	Value \$	Tons Quantity	Value \$	Tons Quantity	Value \$
1923	643,000	101,600,000	205,600	43,100,000	436,400	58,500,000	181,700	227,200,000	254,700	168,700,000		
1924	694,600	118,400,000	219,000	51,600,000	475,600	66,800,000	152,500	189,900,000	323,100	123,100,000		
1925	744,800	133,100,000	218,700	48,600,000	526,100	84,500,000	161,800	519,000,000	364,300	434,500,000		
1926	857,300	157,400,000	225,800	50,000,000	631,500	107,400,000	243,400	547,500,000	388,100	440,100,000		
1927	956,000	167,400,000	207,500	42,700,000	748,500	124,700,000	190,700	351,400,000	557,800	226,700,000		
1928	921,400	158,900,000	230,700	44,900,000	690,700	114,000,000	260,100	262,900,000	430,600	148,900,000		
1929	1,004,500	171,700,000	254,700	44,000,000	749,800	127,700,000	418,000	353,700,000	331,800	226,000,000		
1930	1,022,300	150,800,000	244,100	37,800,000	778,200	113,000,000	421,000	199,600,000	357,200	86,600,000		
1931	883,200	92,100,000	241,200	26,700,000	642,000	65,400,000	393,600	99,300,000	248,400	33,900,000		
1932	737,800	74,200,000	253,500	29,000,000	484,300	45,200,000	386,000	68,100,000	98,300	22,900,000		
1933	770,000	66,700,000	265,700	25,600,000	504,300	41,100,000	445,700	101,400,000	58,600	60,300,000		
1934	871,200	78,700,000	272,800	23,400,000	598,400	55,300,000	465,800	207,900,000	132,600	152,600,000		
1935	885,100	81,100,000	314,500	40,000,000	750,600	41,100,000	415,700	191,100,000	154,900	150,000,000		
1936	991,900	87,100,000	311,400	36,700,000	680,500	50,400,000	352,300	208,500,000	328,200	158,100,000		
1937	1,081,200	103,200,000	328,500	42,500,000	752,700	60,700,000	468,200	341,200,000	284,500	280,500,000		
1938	1,110,700	102,900,000	325,300	33,700,000	785,400	69,200,000	370,800	198,700,000	414,600	129,500,000		

* Imports include coir cordage and fibre, mats and matting, padi and rice, coffee, tea, kapok, mace and nutmegs, pepper, ginger, groundnuts and groundnut oil, sugar, tobacco, vegetables, livestock for food, meat, leather goods, milk, butter, poultry and eggs, feeding stuffs for animals, ataps, cloves, castor oil, gingelly seed and oil, fruits, citronella oil and flowers.

† Exports include rubber seed, coconut products, palm oil and kernels, canned pineapples, arecanuts, sago, tapioca, derris root, hides and skins, gambier, patchouli: leaves and oil, mace and nutmegs, pepper and gambier.

The Value of Malayan Agricultural Trade.

The gross agricultural trade of Malaya in 1938 amounted to 3,125,000 tons, valued at \$565,744,000, as compared with 3,249,000 tons, valued at \$875,000,000 in 1937, 2,998,000 tons valued at \$609,000,000 in 1936 and 2,958,000 tons, valued at \$533,000,000 in 1935. Thus, the volume of trade has been maintained under the difficult conditions obtaining, although the values show a considerable decline.

Net exports of agricultural products, excluding rubber, were 325,302 tons, valued at \$33,747,917, as compared with 328,503 tons in 1937 the highest on record, which were valued at \$42,470,051.

Adding net exports of rubber, the figures become:—

1935	...	730,127	tons	valued	at	\$231,176,882
1936	...	663,701	"	"	"	\$245,218,982
1937	...	796,692	"	"	"	\$383,653,226
1938	...	696,112	"	"	"	\$232,398,123

Reference is invited to Table IV in which are shown the annual imports and exports of agricultural products for the past 16 years. The chief import product is rice and the chief export product rubber; omitting these products, imports exceeded exports by 173,035 tons, but the value of exports exceeded imports by \$28,765,155. Malaya thus draws on other countries to a large extent for many products for internal consumption, as is shown by the following net import figures of the more important:—rice 612,394 tons, valued at \$40,433,064; tobacco 5,903 tons, valued at \$15,415,000; milk to the value of \$9,132,000, sugar 122,681 tons valued at \$8,766,000, vegetables \$4,987,000, fruits \$3,909,000, groundnuts and groundnut oil \$3,407,000, livestock and meat \$4,768,000.

The excess of total agricultural imports over exports was 414,619 tons, the highest since 1928. The excess value of agricultural exports over imports was \$129,452,987, as compared with \$280,486,330 in 1937, and the lowest figure since 1933.

Received for publication 5th May, 1939.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

1st Quarter, 1939.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

The quarter as a whole was a very dry one, the normal short dry season being more pronounced than usual in certain localities. In Mersing District, Johore, January was exceptionally wet, and in Kelantan, monsoon conditions continued during the first half of the month; elsewhere the month was about normal. February was an exceptionally dry month throughout the Peninsula, except in Kulim, Kedah, where abnormal rains were recorded. March was exceptionally dry in Mersing, Johore, and in Malacca very dry weather was experienced until the last week of the month. Elsewhere the month was normally wet.

Prices.

Prices of small-holding rubber remained fairly steady throughout the quarter and are shown in Tables I and II.

Coupon values remained high, the price per picul equivalent ranging from \$26 to \$29; in Parit, Perak, the price rose to \$30. Uncoupons rubber was correspondingly low; in Penang and Kedah it was sold at \$5 to \$6, and in Selangor at \$7 per picul.

Production.

Production figures for small-holding rubber are given in Table III, and the low figures for the quarter reflect both the low quota release and the further increase in holdings out of tapping referred to elsewhere in this article. Of the total amount of rubber produced during the quarter, 78,762 tons, estates of under 100 acres contributed only 31 per cent., although such estates represent 39 per cent. of the total area planted with rubber in Malaya.

Quality of Rubber.

The Kelantan report reviews the efforts made in recent years to improve the quality of small-holding rubber. The following is an extract from the report:—

“ The elimination of lump rubber is now, practically speaking, completed. This follows two years of intensive demonstration and propaganda aided by market conditions. In addition to teaching the raiat to make sheet, it has been necessary to afford considerable assistance in the way of loans for the purchase of equipment for sheet manufacture.

Table I.
Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul of 133 1/3 lbs.)

1st Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	37.00-32.00	35.20-30.00	36.60-32.00	35.30-30.00	35.00-31.00	35.50-32.50	35.50-32.00	39.00-31.00
Unsmoked sheet	36.00-31.50	34.50-29.00	34.60-29.00	34.00-28.00	33.80-30.00	34.00-30.00	33.50-28.20	39.30-30.00
Scrap	29.50-23.00	26.00-24.00	29.00-27.00	—	—	29.00-26.00	29.00-24.50	30.50-26.00
			FEBRUARY					
Smoked sheet	37.00-32.50	35.70-26.20	36.00-31.50	35.50-31.00	35.00-31.00	36.00-34.50	35.70-32.00	34.00-30.00
Unsmoked sheet	36.00-32.00	34.00-25.50	33.50-30.00	34.50-30.00	33.60-29.60	35.00-32.50	33.50-28.40	33.00-28.80
Scrap	30.00-23.00	28.00-27.00	29.40-25.00	—	—	29.50-28.00	30.00-25.00	30.00-25.50
			MARCH					
Smoked sheet	38.00-34.00	36.40-30.00	36.40-32.80	36.50-32.00	36.25-31.00	36.00-33.00	36.20-32.00	36.20-30.00
Unsmoked sheet	37.00-32.50	35.00-29.00	34.40-30.00	35.00-31.00	34.00-30.00	34.00-32.00	33.00-28.30	35.30-29.75
Scrap	29.00-22.50	28.00-27.00	—	—	—	30.00-28.50	30.50-24.60	31.00-26.50

Table II.
Mean of Highest and Lowest Rubber Prices Paid by Local Dealers
at a number of Centres in each State.
(In Straits dollars per picul of 133 1/3 lbs.)

1st Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	36.75-32.50	34.64-32.79	34.83-32.97	34.65-32.00	33.97-31.97	34.50-33.33	35.00-33.38	34.58-32.12
Unsmoked sheet	35.18-31.88	32.82-30.82	32.77-31.13	32.94-30.40	31.93-30.67	33.00-31.17	32.12-29.92	33.71-31.14
Scrap	27.83-26.50	26.00-24.00	29.00-27.00	—	—	28.33-26.83	28.67-26.50	29.04-27.70
			FEBRUARY					
Smoked sheet	37.75-32.75	34.40-31.94	34.77-32.92	34.50-31.94	32.87-31.90	35.67-34.83	35.05-33.00	32.93-30.93
Unsmoked sheet	34.88-32.00	32.98-29.40	32.60-31.25	33.30-30.40	31.82-30.12	34.00-33.17	32.75-30.35	32.30-29.98
Scrap	28.00-26.67	28.00-27.00	29.40-25.00	—	—	29.00-28.17	29.83-26.83	28.90-27.69
			MARCH					
Smoked sheet	37.45-34.75	35.50-32.59	35.13-33.60	35.30-33.00	35.88-32.52	35.50-33.83	34.98-32.85	34.54-31.72
Unsmoked sheet	36.12-33.88	33.77-29.98	32.73-31.05	34.80-31.60	32.56-30.80	33.83-32.50	32.05-29.92	34.15-30.77
Scrap	27.33-25.50	28.00-27.00	—	—	—	29.83-28.83	29.33-26.53	30.67-29.13

Table III.
Production of Rubber on Small Holdings.
(in tons)

	Total 1938	1st Quarter 1938	1st Quarter 1939
Federated Malay States ...	54,330	17,967	10,875
Unfederated Malay States ...	50,442	16,749	11,450
Straits Settlements ...	9,906	3,298	2,123
TOTAL MALAYA ...	114,678	38,014	24,448

Propaganda and demonstration work are now being directed towards the production of better quality sheet. The greater proportion of producers still use alum as a coagulant, padi straw and coconut shells for sieving purposes, coconut shells for latex collection and rubber leaves for spouts; thus it is going to mean a good deal of work to effect a real improvement, but as long as the economic factor remains favourable the progress already achieved by the virtual elimination of lump is expected to continue. Considerable progress has already been made as far as the use of suitable sieves and acid coagulant are concerned while interest in the use of latex cups is now growing.

Efforts are also being directed to encourage the manufacture of smoked sheet, and some 20 cabinets of the Rubber Research Institute type have been built during the past few months, most of them being of medium size and not the small cabinet size and some of them being built and worked co-operatively. The premium obtained for smoked over unsmoked sheet is at present in the vicinity of \$2 to \$2.50 per picul. This is sufficient to maintain interest and no more. "

Efforts to encourage small-holders to produce good quality sheet are seriously hampered by the difficulty experienced in marketing such sheet at a price which justifies the extra labour involved. The Pahang price grading scheme, which has worked successfully in recent years, was introduced in Kinta and Lower Perak at the beginning of the year, but many small dealers have not yet complied with the new regulations. In Perak South several smoke cabinets have been in regular use throughout the quarter and one new cabinet, of 8 piculs capacity, was erected and used by the owner and other small-holders in the vicinity.

Table II.
Mean of Highest and Lowest Rubber Prices Paid by Local Dealers
at a number of Centres in each State.
(In Straits dollars per picul of 133 1/3 lbs.)

1st Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	36.75-32.50	34.64-32.79	34.89-32.97	34.65-32.00	33.97-31.97	34.50-33.33	35.00-33.38	34.58-32.12
Unsmoked sheet	35.18-31.88	32.82-30.82	32.77-31.13	32.94-30.40	31.93-30.67	33.00-31.17	32.12-29.92	33.71-31.14
Scrap	27.83-26.50	26.00-24.00	29.00-27.00	—	—	28.33-26.83	28.67-26.50	29.04-27.70
			FEBRUARY					
Smoked sheet	37.75-33.75	34.40-31.94	34.77-32.92	34.50-31.94	32.87-31.90	35.67-34.83	35.05-33.00	32.93-30.93
Unsmoked sheet	34.88-32.00	32.98-29.40	32.80-31.25	33.30-30.40	31.82-30.12	34.00-33.17	32.75-30.35	32.30-29.98
Scrap	28.00-26.67	28.00-27.00	29.40-25.00	—	—	29.00-28.17	29.83-26.83	28.90-27.69
			MARCH					
Smoked sheet	37.45-34.75	35.50-32.59	35.13-33.60	35.30-33.00	35.88-32.52	35.50-33.83	34.98-32.85	34.54-31.72
Unsmoked sheet	36.12-32.88	33.77-29.98	32.73-31.05	34.60-31.60	32.56-30.80	33.83-32.50	32.05-29.92	34.15-30.77
Scrap	27.33-25.50	28.00-27.00	—	—	—	29.83-28.83	29.33-26.53	30.67-29.13

Table III.
Production of Rubber on Small Holdings.
 (in tons)

		Total 1938	1st Quarter 1938	1st Quarter 1939
Federated Malay States	...	54,330	17,967	10,875
Unfederated Malay States	...	50,442	16,749	11,450
Straits Settlements	...	9,906	3,298	2,123
TOTAL MALAYA	...	114,678	38,014	24,448

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Table IV.
Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of March, 1939.

PERAK					SELANGOR					NEGRI SEMBILAN					PAHANG				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage	
Batang Padang	36,187	11,600	32		Klang	16,143	11,300	70		Seremban	23,639	21,700	92		Raub	10,534	8,400	80	
Kinta	38,874	10,100	26		Kuala Langat	23,881	15,500	65		Tampin	21,806	17,500	80		Kuala Lipis	15,457	5,100	33	
Kuala Kangsar	92,166	61,800	67		Ulu Langat	45,012	16,700	37		Kuala Pilah	31,832	19,100	60		Bentong	12,224	2,800	23	
Upper Perak	15,590	10,000	64		Ulu Selangor	31,463	13,300	42		Jejebu	9,097	1,600	18		Other Districts†	49,373	19,500	42	
Larut & Selama	43,432	6,900	16		Kuala Lumpur	29,277	13,600	67		Port Dickson	11,133	10,200	92						
Krian	9,408	8,700	93		Kuala Selangor†	8,417	4,300	51											
Lower Perak*	26,735	17,900	67																
Dindings	9,873	8,000	81																
	271,005	135,600	50			145,193	74,600	51			97,597	70,100	72			84,588	35,800	42	
MALACCA					PENANG & P. WELLESLEY					SINGAPORE					JOHORE KEDAH				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage						
Central	14,093	9,400	67		North	3,549	2,600	72		Singapore	20,115	600	3			330,007	70,000	20	
Alor Gajah	30,838	17,300	56		Central	10,785	5,900	55								102,126	60,300	59	
Jasin	25,286	8,100	32		South	8,936	6,700	75								2,916			
					Penang	15,822	1,300	8								49,133	34,400	42	
	70,217	34,800	50			30,092	16,500	42								29,830			

The percentage of areas out of tapping in December, 1938, was as follows:—Perak 45, Selangor 45, Negri Sembilan 67, Pahang 29, Malacca 15, Penang and Province Wellesley 35, Singapore 4, Johore 21, Kedah 12.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

‡ Estimated from percentage for rest of Malaya.

In Pahang a second co-operative smoke house has been erected, and also a small number of the cheaper type, although the report from this State indicates a tendency towards unsmoked sheet except in the case of Kuantan where practically all rubber is smoked before sale. The report points out that the complete abandonment of cabinets is precisely what dealers in many districts would prefer, and their continued existence, even though not in use, forces up the price of unsmoked sheet and provides a better income to small-holders.

General Condition of Holdings.

Sanitation on many holdings still leaves much to be desired, but, generally, conditions of upkeep are satisfactory. Slashing of undergrowth in preparation for inspection, is mentioned in several reports and in some districts has been too frequent for fear of a reduced coupon allowance. Certain small-holders have gone even further, and on hillsides where the soil should not be disturbed, have resorted to digging and virtually clean weeding. "Wintering" was general throughout the quarter.

Tapping.

Tables IV and V tabulate the result of the quarterly survey, the latter table providing comparison with last year's figures, from which it will be seen that there was a further increase in the area of holdings out of tapping. At the end of March it was estimated that 42 per cent. of holdings were out of tapping, as compared with 36.4 per cent. at the end of 1938.

There were several factors accounting for this big percentage of untapped holdings. "Wintering" and the incidence of the padi harvest were largely responsible in many districts, but the low coupon issue and the high value of coupons were probably the most important reasons. Sufficient rubber to cover coupons could be obtained in the first month of the quarter, or alternatively coupons would be sold in preference to producing the rubber covered by them.

Table V.
Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	March, 1938		December, 1938		March, 1939	
	Acres	Percentage	Acres	Percentage	Acres	Per-centage
F.M.S. ...	189,000	31.5	264,900	44.2	315,500	52.6
S.S. ...	28,900	23.1	46,100	35.6	51,900	40.0
U.M.S. ...	117,200	21.8	147,900	27.7	164,700	30.8
Malaya ...	335,100	26.9	458,900	36.4	532,100	42.0

Planting.

Most reports indicate considerable interest in the possibility of planting new areas with rubber. In Johore numerous applications were received for permission to remove existing crops to plant rubber, but the majority of these applications, after inspection, were refused. In other parts of the country, on the other hand, little, if any, new planting has yet taken place, and replanting holds no attraction for the small-holder, who hesitates to cut down existing sources of revenue.

In Perak approximately 2,500 acres have been taken up for new planting in one district alone, and the Pahang report also mentions the cutting out of several lots for replanting in Raub and Bentong, and that nurseries for budding have been laid down. Applications for conversion of old *tenggala* padi land have been numerous in the riverine mukims. There have been many enquiries about clonal seed, but budgrafting is being recommended as far as possible, as it may be difficult later for a small-holder to prove satisfactorily that he has used clonal seed.

In Penang and Province Wellesley a total of 150 applications for replanting have been approved. The average size of the holding to be newly planted is 2 to 3 acres.

There was a brisk trade during the quarter in share certificates and prices rose considerably, probably due to the fact that their validity expired on the 31st March. Each certificate gave the right to plant 1/20th acre of rubber trees. In January, certificates were sold at \$3 each in some parts of the country, but the price fell sharply by the end of the quarter to \$1.50.

Pests and Diseases.

Mouldy Rot (*Ceratostomella fimbriata*) was again prevalent following heavy rains, but the dry weather of February helped considerably in its control. The Department distributes considerable quantities of approved fungicides for the control of this disease, but many small-holders revert to the use of tar in spite of the advice constantly given.

Mild outbreaks of *Oidium Heveae* were reported during refoliation period, and root diseases also were reported from various parts of the country. The report from Perak South draws attention to root diseases, and states that, in a quarterly count made in February on the rate of spread, on six 1 acre plots, six trees, apparently healthy in November, showed aerial symptoms of attack. Unfortunately, almost without exception, control measures are neglected by small-holders.

In Pahang giant snails caused damage to young nurseries, and "Meta" fuel was used for their control.

Economic Position of Small-Holders.

There is little to add under this heading to the comments in earlier reports. The low quota release offsets the slightly higher prices ruling, and the large area out of tapping has resulted in an increase of unemployment amongst tappers. A Johore

report states that it is noticeable that more attention is being given to padi planting. It is said that the absence of alternative employment is responsible for this in a small measure, but that the European crisis has had its effect, as small-holders have been advised that the price of rice will rise if war breaks out.

There is a big demand for tappers in Siam and many tappers from Kelantan have gone to work there.

The Pahang report mentions that as a result of the visit to Temerloh of H.H. the Sultan and his advice to small-holders numerous applications have been received for *kampung* land and land for mixed cultivation.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

April, 1939.

The Weather.

April over the greater part of Malaya is usually a wet month. The north-east coastal areas, *i.e.* Kelantan, Trengganu and the east part of Pahang are affected by the North-East Monsoon, and the seasons in these districts, therefore, differ from those obtaining in other parts of the country. At the different recording stations in Kelantan the annual average rainfall for April ranges between 1.44 and 4.18 inches. This year conditions have been most unseasonable and 19.08 inches of rain were recorded at Bachok and only slightly less at other stations.

In Kedah and Penang precipitation was somewhat below normal; Central Kedah was definitely dry.

In Selangor, Negri Sembilan and Pahang a normal amount of rain fell and conditions generally were seasonable. The coastal districts of Selangor experienced heavy rain and some floods occurred locally. In Malacca conditions were very dry.

The whole of Johore and Singapore experienced heavy rain and storms and the total precipitation for the month exceeded the average at all centres.

Crop Reports.

Rubber.—Rubber prices fluctuated slightly but the general level remained unchanged. Although wintering is now over there has been no appreciable increase in tapping.

In Perak it is reported that the distribution amongst small-holders of notices on replanting of rubber is having the desired effect. Small-holders are now becoming more familiar with the regulations governing planting and replanting. Enquiries previously had shown that people in the more rural areas were in some instances entirely ignorant of these rules. Two hundred people attended a lecture on this subject given by the Asiatic Rubber Instructor.

In most States the difference in price between smoked and unsmoked sheet continues to be small. While this position continues instruction by Asiatic Rubber Instructors in the matter of the production of high-quality smoked sheet has little chance of making headway.

Kelantan dealers still pay a fair premium for good quality smoked sheet; the price differentiation between smoked and unsmoked sheet per picul is at present between \$2.50 and \$3. The work of the Asiatic Rubber Instructor and his assistant Demonstrators is having marked results in this State.

Padi.—Stocks have been coming in well to the Government Rice Mills, Krian, Perak, and up to the 16th April some 238,000 piculs had been bought.

Sealing of S.48 continues both at the mills and in the field; at present the mill at Bagan Serai is receiving most of this padi of which 57 per cent. is sealed in the field. At present Government Mill prices little S.48 is leaving the district, and therefore more is being sealed. Up to the 16th April 163,000 piculs, 63 per cent. of the total Krian padi bought, obtained the bonus; the corresponding figure for 1938 was 61 per cent.

A new Government rice mill similar to those already working in Krian is to be erected to deal with the padi produced in the Sungei Manik padi area. At present cultivators in this area are ensured a fair price for their padi by the operation of a Government Buying Agency. Dealers had been paying $4\frac{1}{2}$ to 5 cents per gantang; the Buying Agency operated on several occasions buying at $6\frac{1}{2}$ cents and later at 7 cents and the dealers were forced to bring their prices into line.

Work in connexion with the pumping scheme at the Pahang Tua-Langgar padi area in Pahang is progressing. The pumping plant has arrived and lots to an aggregate of 1,000 acres have been alienated to suitable applicants.

Derris.—Owing to the low price of the commodity most of the holdings planted with derris in Kinta and Batang Padang are now more or less abandoned, and grass and other weeds have been allowed to grow. Dealers in this locality have almost ceased to buy root. The only recent purchase of any size was a quantity of 45 piculs for which a price of only \$5 to \$6 per picul was paid.

It should be noted that the derris grown in this part of the country has a very low rotenone content, (*D. malaccensis*, Kinta type) and is, therefore, not acceptable to the market at the present time, particularly when the root is destined for export to America where buyers estimate toxicity solely on rotenone content.

Arecanuts.—Arecanut husk has now become a saleable commodity. In Johore the wet husk is bought by Chinese dealers who at present pay 6 cents per sack. After it has been dried, it is exported to China for making into blankets and head coverings. The total exports for the month amounted to 191 piculs.

Squirrels.

In Malacca the organized shooting of squirrels has now recommenced. The reward has been fixed at 5 cents per tail as against 10 cents in 1938. It is thought that this reduction in the reward will not militate against the success of the scheme, and that owners of fruit trees will continue to shoot squirrels on their holdings, and only those people who previously used to hunt squirrels for profit in forest and rubber land will be discouraged. The numbers so far killed are less than at the same time in 1938.

DEPARTMENTAL NOTES.

Rural Lecture Caravan.

The Rural Lecture Caravan toured Perak during March and April and visited a large number of centres. The afternoon lectures were abandoned at several centres owing to the difficulty experienced in obtaining an audience, but the evening displays of films and slides were well attended. Among the subjects dealt with through the medium of lectures and pictures are poultry keeping, plant bud-grafting and fruit cultivation, padi selection, and rubber manufacture. The picture slides are explained with the help of a microphone and loud-speaker.

Leave.

Mr. B. Bunting, Acting Chief Research Officer, has been granted 184 days leave prior to retirement from 8th May to 7th November 1939 inclusive. Major C. D. V. Georgi, Senior Chemist, has been appointed to act as Chief Research Officer.

Mr. D. H. Grist, Agricultural Economist, has been granted 192 days leave from 8th May to 15th November 1939 inclusive. Mr. H. L. Barnett, Assistant to Agricultural Economist, will act temporarily as Agricultural Economist.

HILL PADI IN TRENGGANU.

In the *Malayan Agricultural Journal* Vol. XXVII, No. 2, page 52, it is stated that hill padi (*padi huma*) is grown extensively in the Jajahan Timor of Trengganu. This statement was based on a report on Agriculture in Trengganu published in this Journal in April, 1934. The Commissioner of Lands and Mines, Trengganu, states that *padi huma* is no longer grown extensively in the Jajahan Timor or Trengganu.

Statistical. **MARKET PRICES.**

April 1939.

Major Crops.

Rubber.—Daily quotations remained relatively steady throughout the month though at a lower level than in March. No. 1 X. Ribbed Smoked Sheet, loose, opened at 27½ cents per lb. and closed at 27¾ cents. The average of daily quotations was 27.22 cents per lb., as compared with 28.11 cents per lb. in March. The London average quotation per lb. was 7.93 pence and New York 15.78 cents gold, as compared with 8.14 pence and 16.21 cents gold in March.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, April, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak				Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.			
	5	12	19	26	6	13	20	5	12	19	26
Smoked Sheet ...	34.00	33.50	33.00	34.00	35.00	34.00	33.40	32.20	—	33.10	—
Unsmoked Sheet ...	32.00	—	—	—	33.00	33.00	32.50	32.24	32.00	31.53	32.48
Scrap ...	No purchases										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases of rubber at Kuala Pilah on the 27th April.

Palm Oil.—There was a slight fall in prices during April as will be seen from Table II. The March averages of weekly quotations were:—palm oil £13.11.0, kernels £8.16.9.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
April 7	£ 13. 0. 0 Liverpool	£ 8. 12. 6 Rotterdam
" 14	13. 0. 0 "	8. 12. 6 "
" 21	13. 0. 0 "	8. 12. 6 "
" 28	13. 7. 6 "	8. 12. 6 "
Average	£ 13. 1. 2	£ 8. 12. 6

Copra.—Prices remained at the low levels reached at the end of March, the sun-dried grade fluctuating between \$3.40 and \$3.55 per picul and closing at the latter figure on a rising market. The Singapore average price for the month for this grade was \$3.47 per picul as compared with \$3.64 in March. The mixed grade continued to be quoted at 30 cents per picul lower.

Copra cake was unchanged at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in March were as follows:—Siam No. 2 Ordinary \$4.06, Rangoon No. 1 \$3.17, Saigon No. 1 \$3.47, as compared with \$4.05, \$3.07 and \$3.27 in February and \$4.09, \$3.62 and \$3.92 in March 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were: Singapore 26, Penang 32, Malacca 28, as compared with 27, 32 and 30 in February.

The average declared trade value of imports during March was \$3.76 per picul, as compared with \$3.68 in February and \$3.78 in January.

Padi.—In Kedah, prices of padi per 100 gantangs (gallons) were between \$7.50 and \$7.70. In Penang and Kelantan the price was \$8. In Perak the price ranged from \$8 to \$11 with the exception of Perak South where the range was from \$6 to \$13. The ranges elsewhere were: Pahang \$8.50 to \$11, Johore \$8 to \$10, Malacca \$9 to \$10, Negri Sembilan \$7 to \$13.

The Government Rice Mill at Bagan Serai, Perak, increased its price to \$2.20 per picul and the other Government Mill at Parit Buntar increased its price to \$2.10, with a premium at both mills of 10 cents for Seraup 48. The Government Rice Mill, Temerloh, Pahang, paid \$2.20 per picul.

Pineapples.—Singapore prices of canned pineapples, per case of 48 cans of 1½ lbs. each, as fixed by the Central Board of Packers, were as follows:—G.A.Q.: Sliced Flat \$3.05, Sliced Tail \$3.20, Cubes \$3.10; Golden \$3.45, \$3.60 and \$3.50 respectively.

Fresh fruit prices per 100 were as follows:—Singapore 90 cents to \$1.70; Selangor 58 to 80 cents; Johore, 1st quality \$1 to \$1.70, 2nd quality 70 cents to \$1.40, 3rd quality 50 to 90 cents.

Beverages.

Tea.—During April three consignments of Malayan highland tea, comprising 208 packages, were sold on the London market at prices ranging from 1s.3¼d. to 1s.3½d. per lb., the average being 1s.3½d. Four consignments of lowland tea, comprising 316 packages, were sold at prices ranging from 11½d. to 1s.0¼d. per lb., the average price being 1s.0.12d.

The average London prices per lb. realized for tea from other countries, according to the *Tea Market Reports* for April of the Tea Brokers' Association of London, were as follows:—Ceylon 1s.4.49d., Java 1s.3.40d., Indian Northern 1s.0.91d., Indian Southern 1s.2.95d., Sumatra 11.28d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 25th April, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 80, Medium Grown Teas 73, Low Grown Teas 68.

Coffee.—Liberian coffee continued unchanged at \$14.50 per picul. Excelsa opened at \$10.25 per picul and improved to \$10.50. Robusta was quoted throughout the month at \$6.50 per picul.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$8.85 to \$10.19 per picul, and for Sourabaya coffee \$11.88 to \$13.75, the price within these ranges depending upon quality.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$6.95, Medium \$6.41, Mixed \$6.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.62 to \$6.65; Red Whole \$5.06 to \$6.80; Sliced \$9.44 to \$12.81; as compared with \$8.25 to \$12.20, \$4.75 to \$6.35, and \$4.45 to \$6.55 respectively in March.

Pepper.—Prices fell still further during the month owing to small demand. Average Singapore prices per picul were:—Singapore Black \$8.12, Singapore White \$12.40, Muntok White \$12.65, as compared with \$8.37, \$13.19 and \$13.49 respectively in March.

Nutmegs.—The Singapore price for both 110's and 80's continued throughout the month unchanged at \$28 per picul. The March average price was \$28.50. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Prices in Singapore remained unchanged throughout the month at the March levels: Siouw \$85 per picul (nominal), Amboina \$58 per picul. In Penang locally produced mace, dry, was sold at \$75 per picul.

Cloves.—Singapore nominal quotations for both Zanzibar and Amboina continued unchanged at \$40 per picul. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* for 24th April 1939 from Rs. 1.10 to Rs. 1.24 per lb.

Miscellaneous.

Derris.—With a continued small demand prices fell slightly in April. The average price in Singapore for roots sold on a basis of ether extract was \$7.50 to \$9 per picul, and for roots sold on a basis of rotenone content \$17.50 to \$19 per picul. The March averages were \$8 to \$10 and \$17.50 to \$19.50 respectively.

Our New York correspondent, writing on the 11th April, reports that there was practically no change in the price level quoted in his January letter with the exception that 17 per cent. malaccensis was recently offered at 3½d. per lb., reflecting the lack of interest in the United States in this type of root as compared with elliptica.

Gambier.—Prices of both Cube No. 1 and Block advanced by \$1 per picul in the second half of the month. Average Singapore prices per picul were:—Cube No. 1 \$15.40, Block \$7.40 (nominal), as compared with \$15 and \$7 respectively in March.

Sago.—Pearl improved to \$4.25 per picul to average \$4.01, and Flour, Sarawak Fair, rose to \$2.80, averaging \$2.52 per picul. March average prices were \$3.80 and \$2.29 respectively.

Tapioca.—Flake Fair and Pearl Medium were unchanged at \$3.85 and \$4.50 per picul respectively, while Seed Pearl, improved to \$4.10 at the close, averaging \$3.94 as against \$3.90 in March.

Tobacco.—Kelantan prices of prepared tobacco rose again and were quoted as follows, per picul:—1st quality \$100 to \$160, 2nd quality \$75 to \$128, 3rd quality \$60 to \$112. The general range of the three grades of dried leaf was: \$15 to \$40; \$10 to \$28; \$5 to \$20. In Malacca the range was \$16.50 to \$18.50 and in Johore \$5 to \$18. Prepared tobacco in Johore was quoted at \$35 to \$112 per picul.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

March 1939.

Malaya.—Imports of foreign rice during March were 74,583 tons,† and exports 17,992 tons, net imports being 56,591 tons, as compared with 53,801 tons in 1938.¶

Of the imports during March 46 per cent. were consigned to Singapore, 22 per cent. to Penang, 6 per cent. to Malacca, 21 per cent. to the Federated Malay States, and 5 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 45,977 (61.6), Burma 24,892 (33.4), French Indo-China 2,625 (3.5), other countries 1,089 (1.5).

Of the exports during March 81 per cent. were consigned to the Netherlands Indies, and 19 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 10,668 (59.3), Burma 6,847 (38.0), French Indo-China 359 (2.0), parboiled 54 (0.3), Malayan production 64 (0.4).

March net imports by countries of origin, were (in tons, percentages in brackets):—Siam 35,309 (62.4), Burma 18,045 (31.9), French Indo-China 2,266 (4.0), elsewhere 971 (1.7).

India.—Foreign exports during January and February were 36,000 tons, the same as in 1938. Of these exports 2.8 (5.6) per cent. were to the United Kingdom, nil (5.6) per cent. to the Continent of Europe, 41.7 (44.4) per cent. to Ceylon, 5.5 (5.5) per cent. to the Straits Settlements and the Far East, and 50.0 (38.9) per cent. to other countries. The percentages in brackets are for the corresponding period in 1938.

Burma.—Foreign exports from the 1st January to 29th March totalled 1,111,540 tons, as compared with 966,864 tons in 1938, an increase of 15 per cent. Of these exports 58.9 (44.8) per cent. were to India, 6.2 (9.5) per cent. to the United Kingdom, 5.6 (6.0) per cent. to the Continent of Europe, 9.8 (12.0) per cent. to Ceylon, 8.7 (14.2) per cent. to the Straits Settlements and the Far East, and 10.8 (13.5) per cent. to other countries. The percentages in brackets refer to 1938.

Average March prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 206, Small Mills Specials 210.

Siam and Japan.—The latest information available was published in the February Summary.

French Indo-China.—Entries of padi into Cholon during the first quarter of the year totalled 604,193 tons, as compared with 412,694 tons in 1938, an increase of 46.4 per cent. Exports of rice during the same period were 457,087 tons, as compared with 405,519 tons in 1938, an increase of 12.7 per cent.

* Abridged from the Rice Summary for March 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

The February Saigon rice report states that "Difficulty experienced in obtaining padi from the interior has been illustrated by an extraordinary accumulation of chartered tramps in the port of Saigon, where for some time not a single berth was unoccupied. Prices have naturally been influenced by the prevailing scarcity of stocks."

The price of rice rose from \$2.59 to \$2.73 per picul, and of padi from \$1.60 to \$1.73 per picul.

The Netherlands Indies.—The yield of the native rice crop in Java and Madoera for 1938 was estimated at 3,875,897 tons, an increase of 3.9 per cent. as compared with the actual 1937 crop of 3,729,980 tons.

The area harvested in Java and Madoera during 1938 was 9,763,910 acres, an increase of 2 per cent. when compared with the 1937 area of 9,568,780 acres.

Imports into Java and Madoera during 1938 totalled 22,148 tons, and into the Outer Provinces 305,501 tons, as compared with 8,426 and 166,383 tons respectively in 1937, increases of 162.9 and 83.6 per cent. Exports from Java and Madoera to other countries during 1938 were 7,523 tons, and to the Outer Provinces (mainly foreign rice) 75,413 tons, as compared with 16,832 and 193,992 tons respectively in 1937, decreases of 55.3 and 66.1 per cent.

Ceylon.—Imports during the first quarter were 159,912 tons as against 147,320 tons in 1938, an increase of 8.5 per cent. Of these imports 14.8 (14.4) per cent. were from British India, 64.2 (74.0) per cent. from Burma, 0.6 (0.7) per cent. from the Straits Settlements, and 20.4 (10.9) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from 1st January to 8th March totalled 217,733 tons, as compared with 172,160 tons in 1938, an increase of 26.5 per cent. Of these shipments 40.7 (39.2) per cent. were from Burma, 46.6 (50.0) per cent. from Saigon, 11.9 (8.7) per cent. from Siam, and 0.8 (2.1) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments for the Levant from 1st January to 8th March totalled 4,694 tons, as compared with 3,768 tons in 1938, an increase of 24.6 per cent. Shipments for Cuba, West Indies and America from 1st January to 9th March were 40,328 tons, as compared with 50,092 tons in 1938, a decrease of 19.5 per cent.

FERTILIZER PRICES, APRIL, 1939.

The following are the prices at the end of April, 1939, of some of the more important fertilizers.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	—	80.00
Muriate of Potash	...	—	—	—	50	112.00
Sulphate of Potash	...	—	—	—	48	112.00
Superphosphate (concentrated)	...	—	39	—	—	105.00
Superphosphate	...	—	—	—	—	60.00
Basic Slag	...	—	16	—	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble. ‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

MALAYAN AGRICULTURAL EXPORTS, FEBRUARY, 1939.

PRODUCT.	Net Exports in Tons				
	Year 1938	Jan./Feb. 1938	Jan./Feb. 1939	February 1938	February 1939
Arecanuts ...	33,769	6,881	7,857	3,797	4,147
Coconuts fresh †† ...	116,743†	12,011†	15,727†	6,968†	8,282†
Coconut oil ‡ ...	49,140	6,892	8,631	3,834	3,783
Copra ‡ ...	68,754	6,737	1,095	1,047	1,735
Copra cake ...	7,112	683	904	30	49
Gambier, all kinds ...	1,632	245	243	64	176
Palm kernels ...	9,359	1,171	2,008	475	1,010
Palm oil ...	54,377	7,259	6,619	2,765	3,293
Pineapples, canned ...	73,168	11,444	11,371	5,813	6,884
Rubber ¶ ...	360,898¶	72,488¶	57,548¶	32,459¶	24,974¶
Sago,—flour ...	4,537	506	1,860	467	778
„ —pearl ...	4,203	634	436	244	249
„ —raw ...	5,088*	1,155*	526*	656*	319*
Tapioca,—flake ...	981	192	111	91	78
„ —flour ...	3,072*	606*	358*	359*	215*
„ —pearl ...	17,818	2,146	2,282	885	1,190
Derris ...	676	53	204	28	130
‡ Copra equivalent ...	150,944	18,176	15,434	7,416	8,047

† hundreds in number.

* net imports.

¶ production.

Malayan Production of Palm Oil and Kernels (In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
Total ...	7,049.0	6,744.4	13,793.4	1,240.5	1,178.0	2,418.5
Total January to March, 1938 ...	6,641.7	4,609.4	11,251.1	1,200.9	837.0	2,037.9
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 31st March, 1939, were: palm oil 4,129 tons, palm kernels 889 tons.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Average (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	43,212	1,850	4.3	18,771	43.4	513	1.2	20,621	47.7	22,591	52.3	7,999	18.5
Malacca ...	120,763	7,251	6.0	35,084	29.1	2,160	1.8	42,335	35.1	78,428	64.9	24,460	20.3
Penang ...	2,480	—	—	1,131	45.6	9	0.4	1,131	45.6	1,349	54.4	60	2.4
Singapore ...	32,137	6,932	21.5	9,538	29.7	135	0.4	16,470	51.2	15,667	48.8	3,473	10.8
Total S.S. ...	198,592	16,033	8.1	64,524	32.5	2,817	1.4	80,557	40.6	118,035	59.4	35,992	18.1
F. M. S.—													
Perak ...	285,812	15,072	5.3	80,272	28.1	8,383	2.9	95,344	33.4	190,468	66.6	47,632	16.7
Selangor ...	320,036	16,812	5.2	71,242	22.3	7,337	2.3	88,054	27.5	231,982	72.5	55,007	17.4
Negri Sembilan ...	264,541	21,569	8.2	77,028	29.1	16,545	6.3	98,597	37.3	165,944	62.7	44,229	16.7
Pahang ...	86,299	7,550	8.8	26,243	30.4	6,166	7.1	33,793	39.2	52,506	60.8	10,191	11.8
Total F.M.S. ...	956,688	61,003	6.4	254,785	26.6	38,431	4.0	315,788	33.0	640,900	67.0	157,659	16.5
U. M. S.—													
Iohore ...	483,320	24,046	5.0	140,671	29.1	37,781	7.8	164,717	34.1	318,603	65.9	73,197	15.1
Kedah ...	200,411	10,328	5.1	39,793	19.9	7,006	3.5	50,121	25.0	150,290	75.0	44,611	22.3
Kelantan ...	31,224	403	1.3	7,447	23.8	2,424	7.8	7,850	25.1	23,374	74.9	5,522	17.7
Trengganu (d) ...	4,817	nil	nil	49	1.0	nil	nil	49	1.0	4,768	99.0	1,651	34.3
Perlis (e) ...	1,459	458	31.4	239	16.4	155	10.6	697	47.8	762	52.2	294	20.2
Brunei ...	5,746	nil	nil	3,349	58.3	316	5.5	3,449	58.3	2,397	41.7	589	10.3
Total U.M.S. ...	726,977	35,235	4.8	191,548	26.4	47,772	6.6	226,783	31.2	500,194	68.8	125,864	17.3
Total MALAYA ...	1,882,257	112,271	6.0	510,857	27.1	89,020	4.7	623,128	33.1	1,259,129	66.9	319,515	17.0

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX,
FOR THE MONTH OF MARCH, 1939, IN DRY TONS.

FOR THE MONTH OF MARCH, 1939, IN DRY IONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports during the month		Imports January to March 1939		Exports including re-exports during the month		Exports January to March 1939		Stocks at end of month		Consumption during the month to March 1939	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to March 1939	during the month	Jan. to March 1939	during the month		January to March 1939		during the month		January to March 1939		Ports	Dealers		Estates of 100 acres and over
								Foreign	From Malaya States & Labuan	Foreign	Local	Foreign	Local	Foreign	Local				
MALAY STATES :—																			
Federated Malay States	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
States	...	5,374	27,512	8,880	28,980	1,594	10,875	Nil	Nil	Nil	Nil	11,040	381	34,362	5,154	...	3,220	28,702	
Johore	...	2,955	10,015	4,218	12,984	1,293	7,288	Nil	38	Nil	106	2,068	8,188	2,924	11,974	...	1,844	10,819	
Kedah	...	231	6,017	1,970	6,928	226	1,947	Nil	Nil	Nil	Nil	1,494	842	4,033	4,768	...	124	5,984	
Perlis	...	9	36	3	25	19	53	Nil	Nil	Nil	Nil	Nil	16	Nil	77	...	9	35	
Kelantan	...	593	639	315	882	320	1,453	Nil	Nil	Nil	Nil	333	381	736	1,464	...	442	781	
Trengganu	...	26	313	145	355	153	553	Nil	Nil	Nil	Nil	Nil	273	Nil	886	...	3	359	
Brunei	...	18	100	28	108	25	156	...	...	...	...	...	74	...	267	...	Nil	97
Total Malay States	...	8,506	44,632	15,559	50,262	3,793	22,325	Nil	38	Nil	106	14,935	5,157	47,055	24,590	...	5,612	46,777	
S. SETTLEMENTS :—																			
Malacca	...	1,619	2,343	822	2,737	383	1,331	Nil	Nil	Nil	Nil	1,957	6,407	18,238	...	...	1,322	2,471
Province Wellesley	...	924	1,053	236	978	149	180	Nil	Nil	Nil	26,600	6,407	...	...	...	...	545	986
Penang	1,996	3,618	14	13	44	72	2,910	6,959	8,940	Nil	...	10,960	...	...	...	704	2,748	8
Singapore	3,404	19,551	295	100	293	80	174	11,086	37,878	37,878	155	...	...	...	...	3,184	16,638	244
Labuan	...	13	Nil	Nil	Nil	7	25	39	155	...	...	Nil	...	...	...	...	10	Nil
Total Straits Settlements	...	5,400	25,725	3,705	1,171	4,032	691	2,123	6,939	46,973	26,600	28,324	...	...	...	3,388	21,258	3,709
Total Malaya	...	5,400	34,231	48,337	16,730	54,314	4,484	24,448	6,997	46,973	26,706	43,259	5,157	129,575	24,590	...	3,888	26,900	
	...															...		50,486

TABLE II
DEALERS' STOCKS IN DRY TONS

Class of Rubber	Federated Malay States	S'pore	Penang	Province Wellesley	Iohore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	2,783	18,036	2,571	1,629	1,538	68
WET RUBBER	437	597	177	248	306	56
TOTAL	3,220	16,633	2,748	1,877	1,844	124

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to March 1939
Singapore	29	83,844
Penang	...	9,767
Port Swettenham	...	28,545
Malacca	...	3,892
MALAYA	...	11,770
	...	162
	...	510
	...	43,259
	...	129,675

TABLE IV
DOMESTIC EXPORTS

AREA	For month	Jan. to March 1939
Malay States	...	20,033
Straits Settlements	...	1,807
MALAYA	...	21,900
	...	77,501

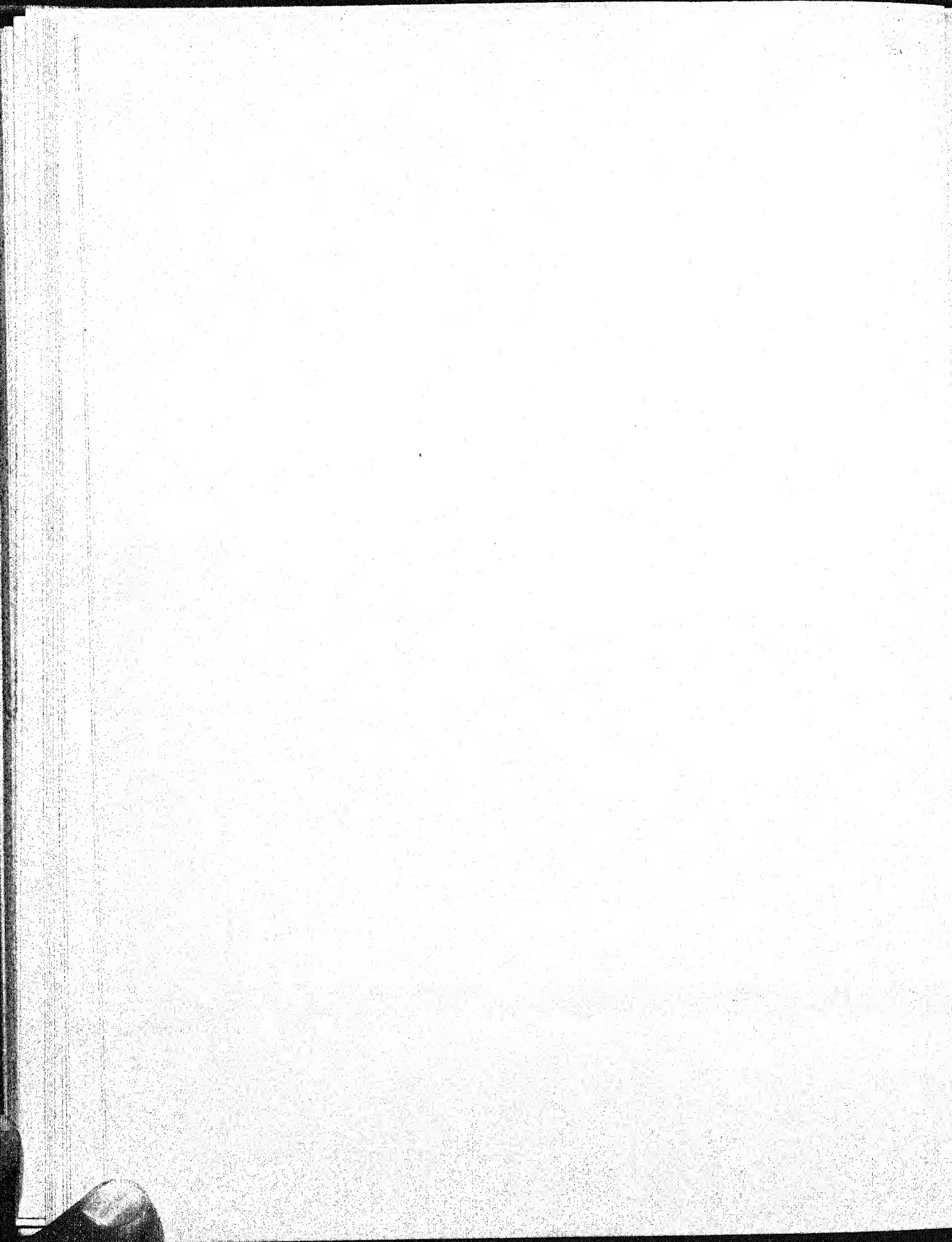
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, i.e. Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] - [2] - [3] - [4] - [5] - [9] - [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25th April, 1939.

METEOROLOGICAL SUMMARY, MALAYA, MARCH, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.					
	Means of		Absolute Extremes			At 1 foot	At 4 feet	Total.	Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.		
	A.	B.	Max.	Min.	Mean of A and B.					High.	Lowest.	High.	Lowest.	Mean of A and B.					
	°F	°F	°F	°F	°F	°F	°F	°F	mm.	in.	Precipitation .01 in or more.	Thunder-storm.	Fog morning obs.	Gale force 8 or more.	hrs.	hrs.			
	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	Precipitation .01 in or more.	Thunder-storm.	Fog morning obs.	Gale force 8 or more.	hrs.	hrs.			
Railway Hill, Kuala Lumpur, Selangor	92.7	71.7	82.2	95	69	88	74	84.1	84.5	7.25	184.2	18	16	10	2	2	211.15	6.81	56
Bukit Jeram, Selangor	90.3	72.1	81.2	93	70	84	74	87.0	88.0	4.81	122.2	155	10	8	—	—	233.20	7.52	62
Sitiawan, Perak	89.7	72.7	81.2	92	71	87	75	83.9	84.3	7.86	199.6	170	15	13	—	—	239.10	7.71	64
Ipoh Aerodrome, Perak	92.0	71.5	81.7	95	69	88	74	83.6	84.1	12.50	317.5	326	18	16	10	—	225.40	7.27	61
Temerloh, Pahang	90.6	72.1	81.3	94	69	84	75	85.3	85.7	4.58	116.3	138	14	10	5	9	222.85	7.19	59
Kuala Lipis, Pahang	89.2	71.2	80.2	92	69	81	73	83.7	83.7	10.93	277.6	221	19	17	5	26	204.20	6.59	54
Kuala Pahang, Pahang	85.4	74.9	80.1	88	70	80	81	84.8	84.8	5.46	138.7	208	14	13	—	—	248.00	8.00	66
Kallang Aerodrome, S'pore	87.1	74.6	80.9	92	72	83	77	82.3	83.0	6.63	168.4	157	14	12	7	—	201.80	6.51	54
Bayan Lepas Aerodrome Penang	88.5	73.8	81.1	91	71	85	76	84.7	84.8	6.35	161.3	331	14	11	6	—	237.50	7.60	63
Malacca Town, Malacca	87.9	73.8	80.9	92	70	82	77	85.1	84.9	2.28	57.9	0.92	10	8	7	—	227.05	7.32	60
Kluang, Johore	89.4	71.1	80.3	92	69	84	73	81.3	81.6	17.63	447.8	280	22	19	15	9	195.40	6.30	52
Mersing, Johore	85.1	71.9	78.5	88	69	78	77	81.8	80.9	3.62	91.9	1.00	16	11	2	—	226.65	7.31	60
Alor Star, Kedah	92.5	71.7	82.1	96	69	87	75	85.5	86.1	8.23	209.0	2.14	16	16	9	1	256.70	8.28	68
Kota Bharu, Kelantan	89.2	71.0	80.1	92	66	86	74	82.6	82.9	0.72	18.3	0.22	11	5	2	3	263.80	8.51	71
Kuala Trengganu, Trengganu	86.5	72.1	79.3	88	69	82	77	82.8	83.5	4.57	116.1	1.64	10	9	2	5	272.40	8.79	73
Labuan	87.6	76.0	81.8	90	73	84	79	88.0	87.7	3.00	76.2	1.06	9	4	—	1	263.75	8.51	71
HILL STATIONS.																			
Fraser's Hill, Pahang 4268 ft.	73.1	61.9	67.5	77	59	69	64	71.2	71.1	7.97	202.4	1.94	16	12	2	16	157.20	5.07	42
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	73.1	53.0	63.1	76	46	68	62	68.8	68.5	13.81	350.8	2.61	18	18	5	2	157.60	5.08	42
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	73.3	58.6	65.9	76	57	70	61	*	*	14.01	355.9	3.05	18	18	—	—	171.35	5.53	46

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.



THE Malayan Agricultural Journal.

JUNE, 1939

EDITORIAL.

Food Crops on Estates.

His Excellency the High Commissioner in a recent speech appealed to estate managers to assist in the defence of Malaya by interplanting their new or replanted areas with foodstuffs.

His Excellency also made it known that the Federated Malay States Government was prepared to extend the system of rebate of rent to any estate land set aside for cultivation as allotments by the labour force.

The successful development of allotment gardens was referred to in the November 1938 number of this Journal; in the present issue we are more concerned with His Excellency's further recommendation to estate owners that they should consider the possibility of developing the food resources of Malaya by the cultivation of food crops on new and replanted areas of rubber.

On another page we publish an article by Mr. W. N. C. Belgrave on the cultivation of food crops on estates, which provides brief cultural notes on such crops as are considered suitable for this type of cultivation.

A leaflet, in English and Tamil, describing suitable crops for allotments may be obtained free of charge from the Department of Agriculture, and also, from the same source, the issue of this Journal referred to above at a cost of 50 cents, post free.

Derris Manurial Experiments.

Consequent upon the development of derris as a secondary crop of importance the economics of manuring become an important consideration. Manurial experiments have been conducted by the Department of Agriculture during recent years and an account of earlier investigations has appeared in this Journal.

As a result of those investigations two species, *D. malaccensis* var. *sarawakensis* and *D. elliptica*, Sarawak creeping, were considered to be the most promising, judged by yield of root and their economic possibilities. The first species, supplying a high ether extract, was particularly suitable for the United Kingdom market, and the second species, *D. elliptica*, Sarawak creeping, with a high rotenone content, was suited to the United States market, which regards rotenone as the primary constituent.

In the present number of this Journal appears the account of manurial trials with the above two species of derris, and the results of this further investigation are both interesting and important.

The experiment with both species consisted of three manurial treatments and a control. Briefly, the results were that *D. malaccensis* var. *sarawakensis* responded markedly to the application of manures in contrast to a poor yield on the control plots. On the other hand, manurial treatments were without significant effect in the case of *D. elliptica*, Sarawak creeping, but the control plots, *i.e.* no manurial treatments, yielded practically double the quantity of root obtained from the first species with the most satisfactory manurial treatment.

Viewed, therefore, purely from the aspect of yield of root in relation to the necessity for manurial treatment, *D. elliptica*, Sarawak creeping, is very obviously the more satisfactory species to plant. There has been, moreover, a recent change in the requirements of the United Kingdom derris market; British insecticide manufacturers now regard rotenone content as of more importance than previously.

It would appear, therefore, that *D. elliptica*, Sarawak creeping, is a suitable species to plant, meeting, as it does, the requirements of both British and American manufacturers with regard to rotenone content, in addition to providing a high yield of root.

Original Articles.

THE CULTIVATION OF FOOD CROPS ON ESTATES

BY

W. N. C. BELGRAVE,

Acting Director of Agriculture, S.S. and Adviser on Agriculture, M.S.

In the course of a speech on Defence made in the Federal Council on the 18th May His Excellency the High Commissioner said:

"The Government of the Federation is prepared to extend further the system of rebate of rent on any estate land suitable for the purpose which estate owners may wish to set aside as allotments for the cultivation of foodstuffs by their labourers. Enquiries should be addressed to the British Residents. Suitable foodstuffs would be groundnuts, cassava, sweet potatoes, maize, bananas and vegetables of all sorts, especially onions, but the selection would be left to the individual. I have also asked estate owners to consider whether they can plant foodstuffs as a cover crop on the areas now being opened up for new planting or for the replanting of rubber. If they cannot do it themselves, they might be able to let out the work to a contractor. I have also asked the Malayan Governments to make as easy as possible the alienation of land for the growing of vegetables."

An article describing certain successful allotment gardens was published in the *Malayan Agricultural Journal* for November, 1938. This publication may be obtained on application to the Department of Agriculture, price 50 cents post free. A leaflet in English and Tamil describing suitable crops for allotments may also be obtained from the same source, free of charge.

It is hoped that the following notes may be of service to those in charge of rubber estates who contemplate planting of foodstuffs on new or replanted areas.

The dominant factor in relation to the growth of dry land food crops in Malaya is the comparative poverty of our soils. On virgin soil one good crop should be obtained and a second medium crop is often possible, but thereafter yields decline rapidly unless heavy manuring with animal manure or compost be undertaken. Large quantities of animal manure are unobtainable on all but a few estates; compost can be made from slashings of natural growth or cover but transport is likely to be expensive. The aim of estates should be to plant relatively small areas sufficient for their own population, so that fresh land may be available in a second or subsequent season.

Steep slopes are unsuited to food cultivation. Undulating land can be used when terraced; even then great care must be taken to avoid soil erosion. Cover crop, if already established, should be left at the edge of the terrace in order to prevent loss of surface soil; if not established, cover should be planted in this position.

On flat land drainage is essential. On peaty areas care must be taken to adjust the height of the water table to prevent the crop suffering from lack of moisture during the dry season.

Effect of Food Crops on Rubber.

Authorities of the Rubber Research Institute of Malaya are of opinion that so far as the trees are concerned "Food crops could probably be cultivated for the first two years after planting without affecting the trees directly. It is suggested that after two years, cultivation of food crops, particularly root crops would be harmful, the longer the period after planting the greater the ill effects." On theoretical grounds, however, the same authorities fear that cultivation (necessarily deep for root crops) may destroy the natural structure of the soil thus ultimately reducing its capacity to absorb water. The obvious danger from erosion is also stressed. Those responsible for rubber estates must of course exercise their own judgment but the writer of these notes is definitely of the opinion that the cultivation necessary to grow one crop, even if a root crop, will not seriously, if at all, impair soil structure. The importance to Malaya of food production will doubtless be given due consideration.

New Plantings.

Possible crops for virgin soil, in order of duration, are ragi, groundnuts and maize, sweet potatoes, yams, bananas and tapioca. Short notes on these follow and further information may be obtained from State Agricultural Officers. Combining the figures for yields given in the notes with the known energy producing value of the various foods, it appears that to replace the normal rice ration of one person for one year would require the produce from 1/10th to 1/7th of an acre of root crops; thus an area of 20 to 30 acres of such crops should produce enough food for a population of 200 for one year.* In point of fact it is unlikely that these foodstuffs would be required completely to replace rice, their use would be rather to supplement a reduced rice ration. Such small areas should be within the means of nearly all estates undertaking new planting. Groundnuts have a higher food value but a lower yield than root crops and the equivalent of a year's ration of rice should be secured from one-quarter of an acre.

Estates would be well advised to plant a mixture of crops in order to take advantage of their differing maturation periods and also to guard against the failure of one or more of them from unsuitable soil conditions or pest attack.

Replanting.

Cropping on replanted areas is a more difficult matter. Practically all such areas suffered severely from exposure in early years and on them tapioca alone may be expected to give even moderate yields. Where compost can conveniently

* These figures are based on the assumption that quantities of foodstuffs supplying similar amounts of energy (expressed in calories) are of equal food value. This is believed to be reasonably correct over a relatively short emergency period but it should be realized that no claim is made that this basis of calculation is valid from the point of view of maintenance of optimum health over lengthy periods.

be applied, a dressing of 10 tons to the acre is recommended, or failing this, the turning in of a cover crop. It is of little use to plant even tapioca on poor, washed, baked soil without preliminary treatment.

Planting Material.

A certain amount of fresh ragi seed is obtainable from the Central Experiment Station, Serdang. Local supplies of planting material of the other crops should suffice for a moderate amount of planting, but any sudden increase of demand which would arise in the event of an emergency might exhaust local supplies. Estate managers who do not see their way immediately to respond to His Excellency's appeal would, therefore, be well advised to lay down areas of one or two acres of nursery to provide their own planting material should this be required later.

Root crops, if near the jungle, may suffer from the depredations of wild pig and it may be necessary to guard such areas or to set poison baits.

Crops.

The food crops which are recommended for planting are detailed below. Brief cultural notes are offered on each crop.

(a) RAGI.

This crop provides one of the most important foods of the Telegu community. Tamils also grow it in their own gardens to a limited extent but showed themselves reluctant to eat it in quantity during the last rice shortage. It is, however, a valuable crop for estates employing Telegu labour, more especially as it will thrive on land of only moderate fertility. The seed rate is 5 lbs. per acre. Yields varying from 500 to 1,000 lbs. per acre may be expected. Owing to the depredations by birds at the time of harvest children should be employed to scare birds.

(b) GROUNDNUTS.

Groundnuts require a light, friable, well-drained soil; heavy compost soils are unsuited to them. A dressing of lime at the rate of 1 ton per acre is recommended. The soil is worked to a depth of about 5 ins. and seed is planted on ridges of 18 ins. apart; seed should be dibbled in on the ridges at 12 ins. intervals, using two or three seeds at each point. Planting towards the end of the wet season is recommended. The nuts are ready to harvest about 100 days after sowing. Yields of about 1,000 lbs. of clean nuts per acre should be secured under favourable conditions. The pods are particularly liable to depredation of rats while the plant is still growing and poison baits would doubtless be advantageous.

(c) MAIZE.

The best soils for maize are rich, light sandy loams along the banks of rivers or streams, more especially where intermittent flooding occurs. Peaty soils are to be avoided and heavy clays are unsuitable; poor soils are useless. The land should be dug over and seed dibbled into holes 2 to 3 ins. deep, spaced 9 to 12 ins. apart

in rows 3 ft. apart. Generally three seeds are placed in each hole and lightly covered with soil which is compressed by the foot of the sower. Planting is best done in March, April or November. Surface weeding is undertaken; later the weaker plants are removed to leave one at each point and as the crop increases in height the soil is mounded around the base of the plants. The crop matures in 3 to 6 months according to variety. Yields of grain of 1,800 to 2,000 lbs. per acre may be expected under favourable conditions.

(d) SWEET POTATOES.

This crop thrives best in a light sandy loam which has been deeply cultivated. Propagation is by cuttings of semi-matured portion of the stem, about 9 ins. long; two nodes are placed underground and one is uncovered, the cuttings are planted about 30 degrees from the horizontal and the soil is compacted around the cuttings. They are planted about 18 ins. apart on ridges which are spaced from 2 to 3 ft. from centre to centre. The trailing stems are periodically turned back on the ridges to prevent them rooting in the soil and causing consequent decrease in the size of the main root tubers. The crop may be harvested from 3 to 6 months after planting depending on variety, and the yield of tubers varies from 3 to 6 tons per acre depending on the level of the fertility of the land and on the variety used. To ascertain whether the crop is ready for lifting a few tubers may be examined. If they be cut through and the sap dries rapidly forming a white crust they are matured. Another indication of maturity is when the leaves begin to turn yellow.

(e) YAMS.

Yams are propagated from tubers, which are usually permitted to sprout and afterwards cut into "sets," each of which should include two young shoots. Deep cultivation and thorough drainage is required. A loose type of soil is the most suitable. Sets are planted at 2 ft. intervals in ridges 4 ft. apart. The crop takes about 10 months to mature and maturity is indicated by cessation of growth and drying of the leaves. The tubers are lifted as required as they do not keep long after harvest. On the other hand if left too long in the ground they become woody and start to sprout. Yields of 7 to 10 tons per acre may be expected, and on soils of high fertility these yields may be doubled.

There are two types of yams, the greater yam which is a coarse tuber and the lesser yam which is of a finer type, and is in general preferred. Some of the lesser yams are thorny climbers; tubers are smaller than those of the greater yam, but are produced in greater quantity, but the yield per acre is not necessarily greater.

Both yams have been found to give higher yields if the plants are allowed to climb strong poles about 10 ft. high.

(f) BANANAS.

The banana flourishes best on heavy soils fairly rich in organic matter and also in moist situations provided the soil is well drained. Propagation is effected by small suckers which are planted at distances of 10 to 15 ins. apart. Large holes are

opened and partly filled with good surface soil. The first bunch of fruits is usually produced at about 1 year from planting. Too many suckers should not be allowed to grow from one parent plant. The variety *Pisang Embun* is probably the heaviest yielder and, therefore, the most desirable for the purpose in view.

Bananas in Malaya are subject to attack of Panama disease, but provided that suckers are obtained from areas where the disease is non-existent there should be a good chance of obtaining at least one harvest.

(g) **TAPIOCA.**

Tapioca will grow on almost any well-drained soil. It has for long borne the reputation of being an extremely exhausting crop, but this bad reputation is not due to the crop itself but to the methods of cultivation formerly employed. Many crops of tapioca were taken off the land without manuring or adequate measures for the prevention of soil erosion, and the land was then allowed to revert to natural conditions.

Tapioca is best planted on ridges at 3 ft. intervals and 3 ft. distance, but may also be planted on the flat. It is propagated by cuttings taken from mature part of the stem. Cuttings 5 to 6 ins. long are planted at an angle of about 30 degrees from the horizontal, with three-quarters of the cutting below the surface of the soil, which is consolidated by treading. The planting distance recommended is closer than that usually employed by Chinese but has the advantage that the necessity for weeding is greatly reduced.

The crop takes from 12 to 14 months fully to mature but current requirements may be lifted 7 or 8 months after planting. Yields of about 7 tons per acre should be obtained under favourable conditions.

Pigs.

The rearing of pigs, more especially where a nucleus already exists, is worthy of serious consideration. The number of pigs in Malaya has been rising steadily during the past few years and breeding animals should be easy to procure.

Sweet potato foliage provides an excellent basis for pig food. Cropping of the vines is done at intervals of 1 month to 6 weeks and liberal application of liquid (pig) manure is made after each cutting to induce fresh growth. Tuber production is not aimed at.

Another good food is colocasia (*ubi keladi*) which grows luxuriantly on the coastal flats. Both leaves and stem are employed, after cooking, for pigs, and the tubers are fit for human consumption.

Experiments conducted at Serdang have shown that pigs fed on a ration containing copra made normal live weight increases and suffered no ill effects from the excess of oil ingested.

Received for publication 30th May, 1939.

THE MALAYAN RUBBER PLANTING INDUSTRY IN 1938.

*Compiled from official and other records by the Economics Branch of the
Department of Agriculture, S.S. and F.M.S.*

Prices.

The Singapore spot price for No. 1 X. Ribbed Smoked Sheet at the beginning of the year was 22 $\frac{3}{4}$ cents per lb. The price improved during January and February to 24 $\frac{3}{4}$ cents but fell heavily in March to 16 $\frac{3}{4}$ cents and to 16 cents at the beginning of April. The same month, however, saw a recovery to 21 $\frac{3}{4}$ cents, and, after a slight fall in May, a further steady improvement to 29 $\frac{1}{4}$ cents in October, the year closing at 28 $\frac{1}{4}$ cents.

The average prices per lb. for the year in the principal markets are shown in Table I, together with corresponding figures for 1937.

Table I
Prices of Rubber per lb.

Market	1937	1938
Singapore (cents, Straits) ...	32.09	24.39
London (pence, sterling) ...	9.42	7.29
New York (cents, gold) ...	16.30	14.56

Areas.

The total area under rubber in Malaya at the end of 1938 was estimated to be 8,296,647 acres, as shown in Table II.

The total area of reserve land on estates* in Malaya at the end of 1938 was 631,286 acres; of this total 21,807 acres were building sites, and 76,783 acres planted with other crops. The total mature area, *i.e.* planted during the season 1930-31 or earlier, was 1,891,878 acres, and the tappable area, as declared by estates, was 1,895,795 acres.

Ownership and Constitution of Estates.

Of the total area of rubber on estates, 2,031,969 acres, 75.3 per cent. is European owned, 15.9 per cent. is owned by Chinese, 4.3 per cent. by Indians, and 4.5 per cent. by other nationalities.

* Estates = estates of 100 acres and over.
Small holdings = estates of under 100 acres.

Table II.

Area Under Rubber in Malaya as at end of 1938.

(in acres)

Territory.	Estates*			Small Holdings†	Total Planted Area
	Mature Area	Immature Area	Total Planted Area	Total Planted Area	
Perak ...	284,285	22,597	306,882	256,264	563,146
Selangor ...	321,221	30,685	351,906	144,577	496,483
Negri Sembilan ...	266,574	16,760	283,334	97,960	381,294
Pahang ...	84,569	5,735	90,304	82,382	172,686
Total F.M.S. ...	956,649	75,777	1,032,426	581,183	1,613,609
Malacca ...	121,437	4,950	126,387	67,983	194,370
Province Wellesley ...	43,326	1,724	45,050	23,160	68,210
Penang Island ...	2,476	402	2,878	14,913	17,791
Singapore Island ...	32,298	245	32,543	20,376	52,919
Labuan ...	—	—	—	1,834	1,834
Total S.S. ...	199,537	7,321	206,858	128,266	335,124
Johore ...	479,541	45,614	525,155	365,996	891,151
Kedah ...	201,928	9,084	211,012	90,752	301,764
Perlis ...	1,450	224	1,674	3,605	5,279
Kelantan ...	31,285	1,268	32,553	59,420	91,973
Trengganu ...	15,361	512	15,873	27,127	43,000
Brunei ...	6,127	291	6,418	8,329	14,747
Total U.M.S. ...	735,692	56,993	792,685	555,229	1,347,914
Total Malaya ...	1,891,878	140,091	2,031,969	1,264,678	3,296,647

* Estates = 100 acres and over.

† Small Holdings = under 100 acres.

Acreage of mature rubber represents acreage planted in season 1930—1931 or earlier.

There were 2,509 rubber estates recorded in Malaya at the end of 1938, of which 856 (1,502,128 acres) were owned by public limited liability companies; the remainder, 1,653 (529,841 acres), were the property of private limited liability companies or privately owned.

There were 1,562 estates (317,889 acres) between 100 and 500 acres planted area, 362 estates (262,874 acres) between 500 and 1,000 acres, 532 estates (1,055,083 acres) between 1,000 and 5,000 acres, and 53 estates (396,123 acres) over 5,000 acres.

Areas Out of Tapping.

The area out of tapping on estates at the end of the year was 531,512 acres, or 28.5 per cent. of the estimated acreage of tappable rubber. In addition, 329,501 acres (17.6 per cent.) were being rested under rotational tapping systems. At the end of January 1938, 10.1 per cent. of tappable rubber was out of tapping, (excluding rotational system resting), but this percentage increased through the year with the decrease in the quota release.

On small holdings it was estimated that 458,900 acres, or 36.4 per cent. of the total area of small holdings, were out of tapping at the end of the year. The area of small holdings out of tapping varies considerably, and fuller reference is made to this subject on a later page.

Budgrafted Areas.

Table III shows the area budgrafted on estates at the end of 1938, together with corresponding figures for 1936 and 1937. Statistics are not available as to budgrafted areas on small holdings, but the total area in 1938 was negligible.

In the following table only the proportion of budgrafts in areas of mixed budgrafts and seedlings is taken into account. The area of budgrafts only (approved clones) was 203,040 acres. The total area of mixed budgrafts and seedlings was 78,806 acres, and there were 19,435 acres planted with clonal seed.

At the end of 1938, of the total area of budded rubber (248,591 acres), 164,466 acres had reached the tappable stage, and 101,410 acres were being tapped.

Table III.

Areas of Budgrafted Rubber in Malaya.

	1936		1937		1938	
	No. of areas	Total acreage	No. of areas	Total acreage	No. of areas	Total acreage
Federated Malay States ...	402	111,369	445	120,927	479	138,140
Straits Settlements ...	51	3,833	54	4,634	57	6,681
Unfederated Malay States ...	175	93,734	178	94,364	197	103,770
Total ...	628	208,936	677	219,925	733	248,591

The Rubber Regulation Scheme.

The International Agreement 1934-38 for the regulation of rubber production continued in operation during the year. Malaya's basic quota was 602,000 tons, out of a world quota of 1,335,250 tons, and the releases were: for the 1st quarter 70 per cent.; 2nd quarter 60 per cent.; 3rd quarter 45 per cent.; 4th quarter 45 per cent., averaging 55 per cent. over the whole year.

The International Agreement, which was due to terminate on 31st December 1938, was renewed for a further period of five years from 1st January 1939. The terms of the Agreement have been revised and new planting will be permitted from 1st January 1939 to 31st December 1940 up to 5 per cent. of the total planted area, and after 31st December 1940 up to percentages to be fixed by the International Regulation Committee. Unconditional replanting is also permitted, but the Committee has the power to review the position and limit replanting after the 31st December 1940. Applications for replanting have, however, to be approved by the Controller of Rubber.

Production, Exports and Stocks.

The production of rubber in Malaya during 1938 totalled 360,898 tons, as compared with 503,127 tons in 1937. Table IV shows the distribution of production.

Table IV.*

Malayan Production of Rubber in 1938.

Area	Production by estates of 100 acres and over	Production by estates of less than 100 acres	Total Production
	Tons	Tons	Tons
Federated Malay States ...	129,728	54,330	184,058
Straits Settlements ...	19,193	9,906	29,099
Unfederated Malay States ...	97,299	50,442	147,741
TOTAL 1938 ...	246,220	114,678	360,898
TOTAL 1937 ...	314,658	188,469	503,127

The exports of rubber in concentrated forms of latex were 4,477 tons less than in 1937, and are shown in Table V. The quantity of rubber estimated to be contained in this exported latex is included in the figures of production given above, and also in the figures of total exports given in Table VII.

* Abstracted from the December statement of acreage, stocks, production, imports and exports of rubber, etc., published by the Registrar-General of Statistics, Straits Settlements and Federated Malay States.

Table V.
Exports of Rubber in Concentrated Forms of Latex.

Year	Dry rubber content of latex in lbs. per gallon			Total	Value
	Under 4.8 lbs.	4.8 to 5.7 lbs.	Over 5.7 lbs.		
	Tons	Tons	Tons	Tons	\$
1931 ...	—	—	—	1,925	472,123
1932 ...	—	—	—	5,192	1,110,103
1933 ...	—	—	—	10,470	2,871,407
1934 ...	—	—	—	14,172	7,119,548
1935 ...	5,286	5,490	2,374	13,150	6,585,369
1936 ...	6,778	7,073	3,086	16,937	10,673,229
1937 ...	7,122	7,512	4,774	19,408	15,429,910
1938 ...	3,630	4,554	6,747	14,931	8,686,793

Local consumption of rubber by manufacturers of rubber goods, tyres, tubes, belting, shoes, etc., amounted to 512 tons, as compared with 576 tons in 1937, 435 tons in 1936 and 593 tons in 1935.

Table VII summarizes shipments of crude rubber from producing countries since 1931. This table is compiled from the Statistical Bulletin of the International Rubber Regulation Committee.

Conditions on Estates.

Estates generally have been maintained in good condition. Manuring has continued to increase in popularity and is developing into a standard practice on many estates.

The scheme for experimental planting of new land was completed in 1938. Experiments are carried out under the control of the Rubber Research Institute of Malaya, with whom and the Controller of Rubber, the estates concerned enter into an agreement as regards maintenance and continuity. The experiments are designed to investigate all important aspects of rubber planting.

Under Rubber Regulation replanting was permitted to the extent of 10 per cent. of each owner's holding in any one year, and to a total of 20 per cent. of the holding during the period 1st June, 1934 to 31st December, 1938. The area replanted during 1938 was 24,350 acres, and the total area replanted since 1st June 1934 (the commencement of Rubber Regulation) amounted to 81,488 acres.

Table VI.

Rubber Stocks in Malaya at end of 1938.

Stocks					Tons
At ports	...	...	...	...	6,152
In hands of dealers	...	...	...	...	31,077
On estates of over 100 acres	...	...	...	...	47,670
Total ...					84,899

Stocks held by small-holders are considered to be negligible.

Table VII.

Shipments of Crude Rubber from Producing Countries.*

(tons)

Year	Malaya includ : Brunei & Labuan	Nether- lands Indies	Ceylon	Sarawak	Siam	French Indo- China	All other Sources	Total
1931	423,000	257,000	62,300	10,400	3,600	11,000	32,400	799,700
1932	406,000	211,000	49,300	7,100	3,000	13,500	18,800	708,700
1933	445,800	282,300	63,800	11,100	7,000	17,300	26,200	853,500
1934	467,400	379,400	79,100	17,600	17,700	19,600	38,300	1,019,100
1935	417,000	282,900	54,300	19,300	28,300	28,700	42,100	872,600
1936	353,700	309,600	49,700	21,000	34,600	40,800	46,300	855,700
1937	469,900	431,700	70,400	25,900	35,600	43,400	59,200	1,136,100
1938	372,046	298,112	49,528	17,792	41,618	58,518	53,109	890,723

* Abstracted from the Statistical Bulletin of the International Rubber Regulation Committee, Vol. 5, No. 3, March, 1939.

Conditions on Small-Holdings.

Quarterly surveys of small holdings out of tapping were made during the year and the results of such surveys are summarized in Table VIII, which also includes December 1937 figures for the purpose of comparison.

Table VIII.

**Percentages of Areas of Small Holdings Out of Tapping
during the year 1938.**

Territory	December 1937	March 1938	June 1938	September 1938	December 1938
	per cent.	per cent.	per cent.	per cent.	per cent.
Federated Malay States ...	19.1	31.5	39.9	45.9	44.2
Straits Settlements ...	10.1	23.1	25.3	33.0	35.6
Unfederated Malay States ...	13.9	21.8	27.6	25.7	27.7
MALAYA ...	16.0	26.9	33.2	36.0	36.4

It will be seen that the number of small holdings out of tapping increased considerably, and this increase was due primarily to the reduced quota operative during the year with the corresponding reduced coupon allowance to small-holders. Another factor was the low price ruling for uncoupons rubber which ranged from \$5 to \$6 per picul, as it is generally considered uneconomic to tap if the price falls below \$6 per picul.

Coupons were again treated as a separate commodity and sold as such, and prices varied considerably, ranging from \$20 to \$30 per picul equivalent.

An additional trade developed in connexion with the new planting allowed under the International Rubber Regulation Scheme. Small-holders received their rights for new planting in the form of share certificates, each share giving the right to plant 1/20th acre of rubber trees. Many small-holders disposed of their certificates to rubber dealers at prices ranging from 60 cents to \$1.80 per share. Despite, however, the widespread disposal of share certificates, small-holders in many districts are using their shares to increase their area under rubber, and in the last quarter of the year share certificates had increased in value to \$1.50.

In order to meet any demand which there may be from small-holders for high-quality planting material for new planting, nurseries have been laid down at a number of Agricultural Stations for multiplying suitable clones of budwood for sale at cost price.

Attention was directed throughout the year to improvement in the quality of small-holding rubber, and considerable help and encouragement were given by the Asiatic Rubber Instructors to small-holders.

An obvious essential to any sustained improvement in the quality of the rubber made by small-holders is that they should be able to obtain a premium for the better product sufficiently large to make it economically worthwhile for them to expend

the extra labour and time involved in making the better product. In localities where this essential has obtained smoke cabinets have proved very satisfactory and well adapted to the small-holder's needs.

Unfortunately in most parts of the country there has been a tendency during the year for the margin of price between smoked and unsmoked sheet to narrow considerably and, at the end of the year, in most rural areas this margin has been much too small for it to pay the small-holder to produce smoked sheet, and smoke cabinets, erected under more favourable conditions in this respect, have, for the most part, remained idle.

The general condition of small holdings is satisfactory, and here again valuable help has been given by the Asiatic Rubber Instructors. From most States reports are received of terracing, silt-pitting, general clearing up, or slashing of undergrowth, but there is no indication of sustained improvements and amelioration of conditions.

Propaganda on the improvement of tapping was continued by the Asiatic Rubber Instructors but improvement in this direction is slow.

Pests and Diseases.

Rats have become a serious pest in many replanted areas and in some new planted areas, and special measures have been developed to combat them.

The cockchafer pest has continued to spread in certain areas situated in the vicinity of jungle although it is not yet a very serious problem. The position is being carefully watched and experiments in preventive measures are being undertaken.

Thrips and mites continued to give a certain amount of trouble in young rubber areas; control was maintained by sulphur dusting.

Giant snails also continued to be a pest in young areas. "Meta" fuel poison baits are now an established method for the immediate control of this pest, followed by the use of calcium arsenate bricks to maintain control.

The control of "white ants" is now receiving more attention on small holdings than was formerly the case. Chemicals for this purpose have been supplied in some districts at cost price through the Department.

Mouldy rot is still the most serious disease affecting rubber small holdings. The Department has continued to sell approved fungicides at cost price to small-holders, and Asiatic Rubber Instructors have helped in their distribution.

Labour.

The total labour force employed on estates at the end of 1938 was 296,307, composed of 196,312 men, 79,947 women, and 20,048 children, or 14.6 labourers employed per 100 planted acres of rubber. At the end of 1937 the total estate labour force was 351,404 persons, or 17.3 per 100 acres.

Acknowledgment.

Acknowledgment is made to the Rubber Research Institute of Malaya for information supplied relating to conditions on estates and to pests and diseases.

MANURIAL TRIALS WITH DERRIS

BY

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Introductory.

An account was given in a previous number of this Journal⁽¹⁾ of an exploratory manurial experiment carried out with various species of Derris at the Central Experiment Station, Serdang.

The results showed that the application of artificial manures with and without the addition of lime caused significant increases in yield of root.

Of the various species of Derris included in that experiment, *D. malaccensis* var. *sarawakensis* and *D. elliptica*, Sarawak creeping, were the two most promising judged by yield of root and economic possibilities. Roots from plants of the first named species, which are characterized by a high ether extract combined with low rotenone content, were then favoured by British insecticide manufacturers. Roots of *D. elliptica*, Sarawak creeping, with their higher rotenone content, even though this is associated with a moderate ether extract, were more likely to find a market in the United States of America, where root is judged primarily on its rotenone content.

The present paper describes further manurial trials carried out with these two species at Serdang.

Lay-Out of Experiment.

The site chosen was in Field 14. The soil is rather heavy; it may be described as a greyish yellow loam containing from 40 to 50 per cent. fine fractions.

The lay-out in both cases was a 4 x 4 Latin square. Each plot measured 35 ft. x 39 ft., equivalent approximately to 1/32nd acre. An unplanted discard area, 6 ft. wide, surrounded each plot.

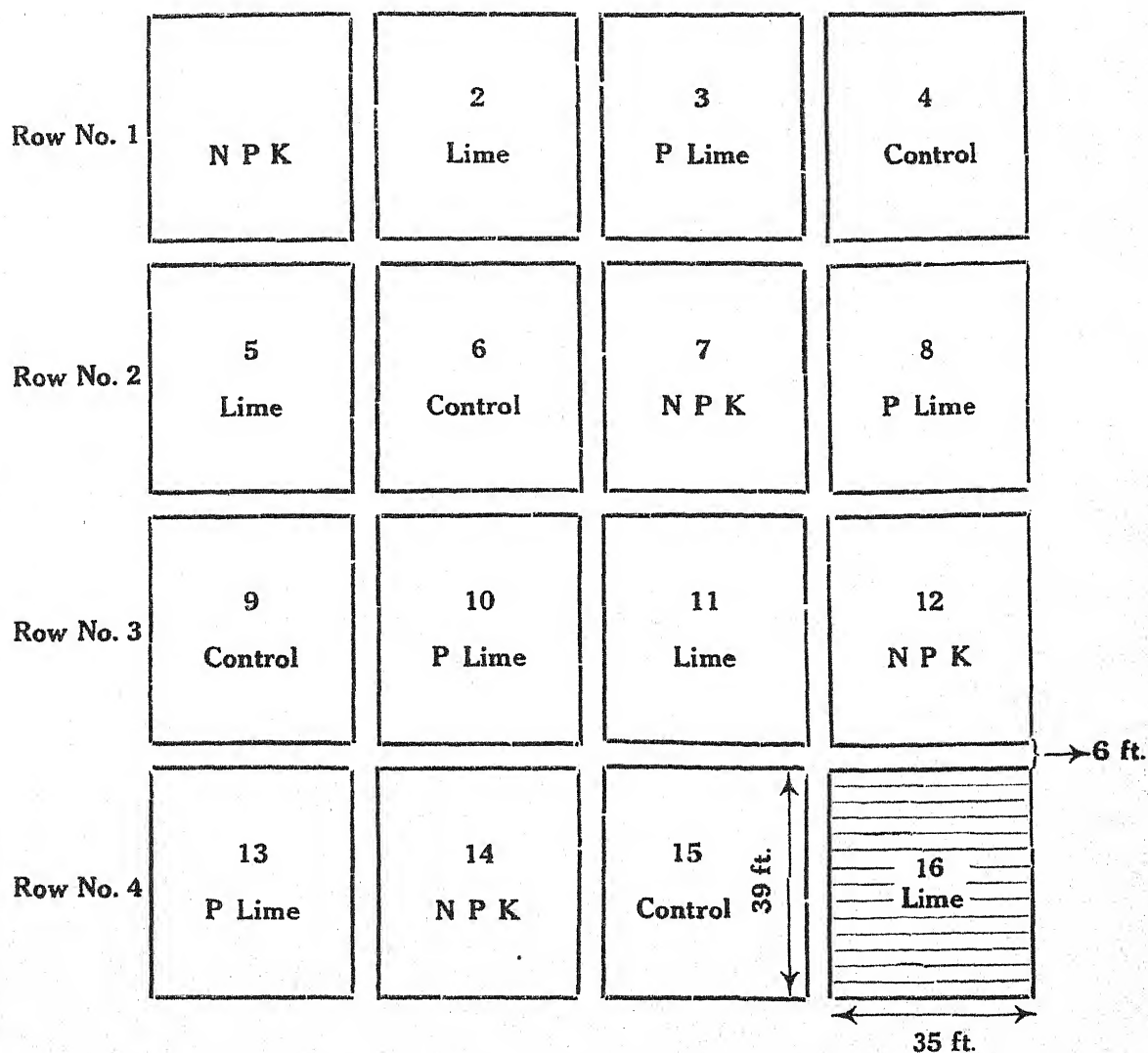
A plan of the lay-out of one set of plots is shown in Diagram I.

Planting and Manurial Treatments.

The land had been under cover crops for three years before the experiment. Deep cultivation was given before planting the rooted cuttings. In both cases the cuttings were taken from a mixed population and randomized before striking.

The cuttings were set in rows 3 ft. apart with the same distance between the plants in each row. There were 13 rows with 12 plants in each row.

Diagram I.
Arrangement of Plots in Manurial Trials.



Note.—The numbers refer to the individual plots, the respective manurial treatment being shown below in each case.

The plots of *D. malaccensis* var. *sarawakensis* were planted in November, 1935, those of *D. elliptica*, Sarawak creeping, a month later.

The experiment comprised three manurial treatments and a control as shown below:—

Treatment No.	Details of Manure	Rate of Application lbs. per acre.
1	Calcium cyanamide	— 280 (53 lbs. N)
	Basic slag	— 336 (54 lbs. P_2O_5)
	Sulphate of potash	— 56 (30 lbs. K_2O)
2	Rock phosphate	— 336 (101 lbs. P_2O_5)
	Slaked lime	— 533
3	Slaked lime	— 1,066
4	Control (no treatment)	

The manurial dressings were applied in January 1936, that is two months after planting in the case of *D. malaccensis* var. *sarawakensis* and one month for *D. elliptica*, Sarawak creeping.

During June, 1936, seed of *Crotalaria usaramoensis* was sown between the rows of plants with the object of suppressing the growth of weeds. The cover plants were cut back some five months later.

Harvesting and Analysis of Roots.

Harvesting was carried out during January, February and March 1938. The plots of *D. malaccensis* var. *sarawakensis* were cleared first. In both cases the plants were between 25 and 26 months old when harvested.

The development of the plants of *D. malaccensis* var. *sarawakensis* contrasted somewhat unfavourably with those of *D. elliptica*, Sarawak creeping. Whereas the latter had formed a dense cover successfully suppressing weed growth, the *D. malaccensis* var. *sarawakensis* plants were rather thin and straggly. The erect nature of this species necessitates frequent cultivation if the plants are not to suffer as a result of competition from weeds.

The following procedure was adopted. The stems of the individual plants in each plot were cut down to ground level, after which the roots were lifted. The roots were cleaned from adhering soil and separated from the stems, which were discarded.

The roots were sun-dried until individual pieces snapped when bent. The roots were then weighed, all pieces having a diameter greater than half an inch being excluded. The material was sampled by quartering until about 2 lbs. remained. This quantity was chopped finely and a moisture determination of the material carried out immediately. The weight of root for each plot was then calculated on a standard moisture content of 8 per cent. Root of this moisture content is termed "air-dry."

Another portion of the finely chopped material was ground for analysis. Both rotenone and ether extract determinations were made.

In the case of plants of *D. elliptica*, Sarawak creeping, a varying proportion of fine stem roots is found. The removal of these roots is a tedious operation and might not be practicable in the cultivation of the crop on a large scale.

In the case of two plots for each manurial treatment these stem roots were collected for the purpose of obtaining information regarding the proportion which they bear to the root as harvested ordinarily, and also of determining their toxic content.

No account has been taken of these stem roots in calculating the figures for yields in connexion with the manurial treatments.

The details for yield of root and toxic content for each species are given separately.

(A) *Derris malaccensis* var. *sarawakensis*.

Table I shows the yields of air-dry marketable root from individual plots arranged according to rows and manurial treatments.

Table I.
Yields of Air-dry Marketable Root of
***Derris malaccensis* var. *sarawakensis* per Plot.**

Row No.	Manurial Treatment				Row Total
	N P K	P Lime	Lime	Control	
	lbs.	lbs.	lbs.	lbs.	lbs.
1 ...	28.7	24.1	16.1	10.8	79.7
2 ...	33.0	27.0	32.1	15.3	107.4
3 ...	32.5	37.2	36.9	20.7	127.3
4 ...	37.4	37.5	39.8	27.9	142.6
Manurial Treatment Totals ...	131.6	125.8	124.9	74.7	457.0
Manurial Treatment Means ...	32.9	31.4	31.2	18.7	General Mean 28.6

Table II shows the calculated yields of root per acre for the various manurial treatments, the yields expressed as percentages of the control, and the costs of the manures based on prices prevailing in January, 1936.

Table II.

Calculated Yields of Root of *Derris malaccensis* var. *sarawakensis* per Acre, Yields of Root expressed as Percentages of Control, and Comparative Costs of Manures.

Manurial Treatment	Mean Yield of Root per Plot	Calculated Yield of Root per acre	Yield of Root calculated as Percentage of Control	Cost of Manures per acre (January 1936)
	lbs.	lbs.	per cent.	\$
N P K ...	32.9	1050	175.9	20.00
P Lime ...	31.4	1002	167.9	10.50
Lime ...	31.2	996	166.8	9.00
Control ...	18.7	597	100.0	—

The results may be summarized as follows:—

- (a) A substantial increase in yield for each of the three manurial treatments.
- (b) A statistical analysis of the figures shows that these increases are due to the manurial dressings. (Treatments significant at 100 to 1 chance).
- (c) The mean increase in yield due to manurial treatments is 70.2 per cent. The small variations from the mean for the different treatments are not statistically significant.
- (d) The application of slaked lime at the rate of approximately half a ton per acre is the most economical treatment under the conditions of the experiment.
- (e) The low figures for yields on the unmanured plots confirm those obtained in a previous experiment carried out in the same field with this species in which yield of root and toxic content were correlated with age of plants⁽²⁾. In that experiment the calculated yield of air-dry marketable root per acre from plants of approximately the same age was 664 lbs. compared with 597 lbs. in the present experiment.

Table III shows the figures for rotenone and ether extract for average samples of root from the individual plots together with the true averages for the different manurial treatments and control.

The figures indicate that the lowest rotenone and ether extract are associated with the complete manurial treatment. Statistical analysis shows, however, that the differences in toxic content, both for rotenone and ether extract, between treatments are not significant.

Table III.

**Rotenone and Ether Extract of Marketable Root of *Derris malaccensis*
var. *sarawakensis* from Individual Plots.**

(Moisture-free basis)

Manurial Treatment	Serial No. of Plot	Rotenone	Average Rotenone*	Ether Extract	Average Ether Extract*	Proportion of Rotenone to Ether Extract	Average Proportion of Rotenone to Ether Extract*
N P K	1	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
	7	2.84	3.29	19.57	21.05	14.5	15.6
	12	2.64		18.99		13.9	
	14	3.84		22.38		16.3	
		3.73		22.85		17.1	
P Lime	3	3.32	3.80	20.32	23.44	16.3	16.2
	8	4.13		24.74		16.7	
	10	3.72		23.32		16.0	
	13	3.96		24.62		16.1	
Lime	2	3.69	3.67	20.61	23.98	17.9	15.3
	5	2.90		21.03		13.8	
	11	3.91		26.42		14.8	
	16	4.07		25.47		16.0	
Control	4	3.39	3.82	23.72	24.29	14.3	15.7
	6	4.34		26.38		16.4	
	9	3.55		23.08		15.4	
	15	3.91		24.26		16.1	

* The average figures are the true averages calculated from the corresponding yields of root on each plot.

The average ether extract, calculated on a moisture-free basis, is 23.19 per cent. This is nearly 2 per cent. higher than that found in the previous experiment carried out with this species and to which reference has already been made (²). In that experiment the average figure for roots from plants aged 24 months was 21.23 per cent. on a similar basis.

The narrow range of variation in the figures for the proportion of rotenone to ether extract for the different treatments is of interest, the mean being 15.7 per cent.

As indicated previously, the rotenone content of root of this species of *Derris* is too low to admit of its being sold on such a basis. The root must be disposed of on a basis of ether extract, for which at present a lower price is paid. The ether extract of the root on an air-dry basis (moisture content 8 per cent.) is approximately 21.3 per cent.

The latest price for *derris* root sold on an ether extract basis is approximately 14 cents per lb. c.i.f. New York (Straits currency).

(B) *Derris elliptica*, Sarawak creeping.

Table IV shows the yields of air-dry marketable roots from individual plots arranged according to rows and manurial treatments.

Table IV.
**Yields of Air-dry Marketable Root of *Derris elliptica*,
Sarawak creeping, per Plot.**

Row No.	Manurial Treatment				Row Total
	N P K	P Lime	Lime	Control	
	lbs.	lbs.	lbs.	lbs.	lbs.
1 ...	68.6	49.5	56.4	67.7	242.2
2 ...	55.1	47.9	73.5	55.1	231.6
3 ...	50.8	51.9	68.4	62.2	233.3
4 ...	52.6	56.6	53.6	59.6	222.4
Manurial Treatment Totals ...	227.1	205.9	251.9	244.6	929.5
Manurial Treatment Means ...	56.8	51.5	62.9	61.1	General Mean 58.1

Table V shows the calculated yields of root per acre for the various manurial treatments, the yields expressed as percentages of the control, and the costs of the manures based on prices prevailing in January, 1936.

Table V.

Calculated Yields of Root of *Derris elliptica*, Sarawak creeping,
per Acre, Yields of Root expressed as Percentages of
Control, and Comparative Costs of Manures.

Manurial Treatment	Mean Yield of Root per Plot	Calculated Yield of Root per acre	Yield of Root calculated as Percentage of Control	Cost of Manures per acre (January 1936)
	lbs.	lbs.	per cent.	\$
N P K ...	56.8	1818	93.0	20.00
P Lime ...	51.5	1648	84.3	10.50
Lime ...	62.9	2013	102.9	9.00
Control ...	61.1	1955	100.0	—

The figures indicate a slightly greater mean yield of root for the control plots than for those receiving a complete manurial treatment or a mixture of rock phosphate and slaked lime. Statistical analysis of the figures showed, however, that these small differences in yield could not be attributed to the respective manurial treatments.

The calculated mean yield of 1,955 lbs. per acre for the control can be considered very satisfactory.

It can only be concluded, therefore, that the soil in this field is sufficiently fertile to produce a satisfactory yield of root of this species without the addition of artificial manures or lime and that their addition has no appreciable effect in that respect.

Table VI shows the figures for rotenone and ether extract for average samples of marketable root from the individual plots, together with the true averages for the different manurial treatments and control.

While there are small differences in toxic content, both for rotenone and ether extract, between treatments, statistical analysis shows that these differences are not significant.

Similarly to *D. malaccensis* var. *sarawakensis*, there is only a narrow range of variation in the figures for the average proportion of rotenone to ether extract for the different treatments. The mean figure is 30.1 per cent.

The rotenone content of root of this species is satisfactory and it can be disposed of on such a basis. The average rotenone content, calculated on an air-dry basis (moisture-content 8 per cent.), is 6.80 per cent.

The latest prices for root sold on this basis are about 20 cents per lb. (Straits currency) for root with a rotenone content from 5 to 6 per cent. and about 25 cents per lb. for root with a minimum of 8 per cent. In both cases the prices are for material c.i.f. New York.

Table VI.
 Rotenone and Ether Extract of Marketable Root of *Derris elliptica*,
 Sarawak creeping, from Individual Plots.

(Moisture-free basis)

Manurial Treatment	Serial No. of Plot	Rotenone	Average Rotenone*	Ether Extract	Average Ether Extract*	Proportion of Rotenone to Ether Extract*	Average Proportion of Rotenone to Ether Extract*
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
N P K	1	6.29	7.30	20.18	24.14	31.1	30.2
	7	7.82		25.75		30.4	
	12	6.97		23.22		30.0	
	14	7.92		26.79		29.6	
P Lime	3	7.32	7.66	23.62	24.79	31.0	30.9
	8	7.48		24.29		30.8	
	10	7.96		27.02		29.5	
	13	7.85		24.22		32.4	
Lime	2	7.22	6.94	24.00	23.62	30.1	29.4
	5	7.25		23.68		30.6	
	11	6.63		23.00		28.8	
	16	6.62		23.86		27.7	
Control	4	6.26	7.19	22.90	24.24	27.4	29.7
	6	7.48		26.01		28.8	
	9	7.53		23.35		32.3	
	15	7.63		25.04		30.5	

* The average figures are the true averages calculated from the corresponding yields of root on each plot.

Stem Roots of Derris elliptica, Sarawak creeping.

Table VII shows the yields of air-dry stem roots from two individual plots for each manurial treatment together with the corresponding amounts of root recorded in Table IV.

Table VII.
Comparison of Yields of Air-dry Stem Root and of Root of *Derris elliptica*, Sarawak creeping, as usually Harvested.

Manurial Treatment	Serial No. of Plot	Weight of Stem Root	Weight of Root as usually Harvested (cf. Table IV)	Proportion of Stem Root to Root as usually Harvested
N P K	1	lbs.	lbs.	per cent.
	14	28.9 16.5	68.6 52.6	42.1 } 31.4 } 36.8
P Lime	10	10.3	51.9	19.9 }
	13	12.2	56.6	21.6 } 20.8
Lime	2	13.5	56.4	23.9 }
	5	17.6	73.5	23.9 } 23.9
Control	6	16.2	55.1	29.4 }
	9	15.6	62.2	25.1 } 27.3

The results show no relationship between the amounts of the two kinds of root. The average figures range from 20.8 to 36.8 per cent.

The relatively large proportion of the fine stem roots in the case of the two plots for the complete manurial treatment is of interest.

Table VIII shows the figures for rotenone and ether extract for average samples of stem root from two individual plots for each manurial treatment.

A comparison of these figures with those given in Table VI shows that the fine stem roots have a much lower toxic content both in respect of rotenone and ether extract.

The question of the inclusion of the fine stem roots depends on whether the cost of separating them can be more than counterbalanced by an increased yield of root of a slightly reduced toxic content.

In the present experiment, the total yield of air-dry root from the 8 plots as usually harvested was 476.9 lbs. with a calculated rotenone content of 6.80 per cent. The total yield of air-dry stem roots from the same plots was 130.8 lbs. with a calculated rotenone content of 3.57 per cent.

The total yield of both kinds of root amounts, therefore, to 607.7 lbs. with a rotenone content of 5.92 per cent.

Table VIII.
 Rotenone and Ether Extract of Stem Root of *Derris elliptica*, Sarawak
 creeping, from Individual Plots.

(Moisture-free basis)

Manurial Treatment	Serial No. of Plot	Rotenone		Average Rotenone*		Ether Extract		Average Ether Extract*		Proportion of Rotenone to Ether Extract		Average Proportion of Rotenone to Ether Extract*	
		per cent.		per cent.		per cent.		per cent.		per cent.		per cent.	
N P K	1	3.49		3.50		12.75		12.50		27.4		28.0	
	14	3.50				12.06				29.0			
P Lime	10	3.88		4.20		14.68		14.59		26.4		28.8	
	13	4.46				14.51				30.7			
Lime	2	3.46		4.05		10.83		13.08		32.0		30.9	
	5	4.51				14.80				30.5			
Control	6	3.70		4.01		12.66		12.55		29.3		32.0	
	9	4.33				12.44				34.9			

* The average figures are the true averages calculated from the corresponding yields of root on each plot.

The inclusion of the stem roots would still allow of the root being disposed of on a basis of rotenone content, the lower limit for this being 5 per cent.

As stated previously, the work is tedious, and necessitates the unravelling of the individual stems. A labourer may recover about 8 lbs. of these fine roots per day. Assuming the moisture content of the fresh root to be about 65 per cent., the above quantity would be equivalent to about 3.5 lbs. of air-dry root.

Assuming that the quality of a consignment is unaffected by the inclusion of the fine stem roots, then 3.5 lbs. would be worth, on the basis of the price previously quoted, about 70 cents. This is only slightly more than the bare cost of harvesting.

Summary.

The results of the investigation may be summarized as follows:—

(a) *Derris malaccensis* var. *sarawakensis*.

- (i) This species, while yielding poorly on the control plots, showed a marked response to the application of manures.
- (ii) The calculated yield of root for the figures of control plots amounted to 597 lbs. per acre, increasing to about 1,000 lbs. per acre as a result of the application of manures.
- (iii) Lime applied at the rate of half a ton per acre proved the most economical treatment.
- (iv) The toxic content of the root was unaffected as a result of any of the manurial treatments.
- (v) Root of this species can be disposed of only on a basis of ether extract, the rotenone content being insufficient to meet the present minimum market standard of 5 per cent.

(b) *Derris elliptica*, Sarawak creeping.

- (i) The calculated mean yield of root for the control plots amounted to 1,955 lbs. per acre.
- (ii) Manurial treatments were without significant effect on the yield of root.
- (iii) The toxic content of the root was unaffected as a result of any of the manurial treatments.
- (iv) Root of this species can be disposed of on a basis of rotenone content.
- (v) The harvesting of the fine stem roots associated with plants of this species is shown to be a doubtful economic proposition.

References.

1. Varietal and Manurial Trials with *Derris*. C.D.V. Georgi, J. L. Greig and Gunn Lay Teik. *Malayan Agricultural Journal*, Vol. XXIV, No. 6, June 1936, p. 268.
2. Variation in Toxic Content of Roots of *Derris malaccensis* var. *sarawakensis* with Increase in Age of Plants, C. D. V. Georgi and Gunn Lay Teik. *Malayan Agricultural Journal*, Vol. XXVII No. 4, April 1939, p. 134.

Received for publication 16th March, 1939.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

May, 1939.

The Weather.

In North Kedah normal wet weather was experienced, but in Central and South Kedah unusual heavy falls of rain occurred; at Sungei Patani 20 inches were recorded.

In Krian, north and west Perak, Penang and Province Wellesley, similarly heavy rainfall occurred, the total precipitation in Penang being almost double the normal figure. A large proportion of this rain fell on the 6th and 7th May, 12 inches being recorded during the two days at Bukit Mertajam and 9.37 inches on the 7th alone at Bukit Merah. Floods were widespread, and it is reported that much coarse sand carried down from clean-weeded holdings in Kedah and the west of the Province was deposited on the rice fields near rivers. There were similar heavy falls of rain on these two days in the other parts of the country mentioned and some flooding.

Elsewhere in Perak, and in Pahang, Selangor and Negri Sembilan, weather conditions were as usual, the rain being heavier during the first half of the month than in the latter half.

In Johore and Singapore the weather was hot and dry and the rainfall below normal.

Crop Reports.

Rubber.—Prices tended to improve and good quality smoked sheet fetched from \$33 to \$35 per picul. The top price reached in Singapore was \$37. This price increase and the advent of favourable weather resulted in an increase of tapping in certain areas.

Padi.—In the main northern padi growing areas preparations and cultivation for the new season's crop are now commencing.

At Panchang Bedena in Selangor the harvest is now over. Returns have not yet been received, but it is expected that yields will be satisfactory. The price paid by dealers for padi has ranged between 9 and 12 cents per gantang. Already 5 tongkang loads of padi have left Sungei Besar for Kuala Selangor and Klang.

The Padi Buying Agency at Sungei Manik in Perak bought at 7½ cents per gantang on several occasions, and early in the month Chinese dealers were paying up to 8 cents. Prices later stood at 6½ to 7½ cents.

In Malacca, sites have been chosen and all arrangements made for seed farms for the new season. Evidence of the increasing utility of seed farms has been noticeable in all districts in this Settlements during the local padi competition. "Seed farm" is now a recognized term among many cultivators and there is evidence that

the amount of seed padi being distributed is increasing greatly. For the coming season the number of varieties of padi grown in seed farms will be extended and will now include Siam 29, Milek Puteh 9, Nachin 11 and Serendah strains. Hitherto only Siam 29 and Milek Puteh 9 were used.

Coconuts.—Almost all copra at present marketed by small-holders is sold in an under-dried condition, and market prices are accordingly standardized on a basis of high moisture content. At present prices the differences in price between well-prepared and under-dried copra is very small and preparation of the former cannot economically be carried out. The position is well illustrated by the following extract from the report of the State Agricultural Officer, Kelantan:—

“ At Bachok good dry copra is at present fetching \$2.95 per picul as against \$2.70 for the normal under-dried product. But whereas 1,000 nuts will produce 5 piculs of the latter, barely $4\frac{1}{2}$ piculs of the former are obtained. From these figures it is not surprising that our drive for good quality copra continues to languish.”

Bananas in Negri Sembilan.—Exports of bananas during May were as follows:—Jelebu 10,603 piculs, Seremban 509 piculs. In both Districts a decline in yield is reported due to the fact that little new planting is taking place, whilst the older plantations have deteriorated. In most of these holdings what soil remains is so impoverished that replanting is out of the question and the lack of new land necessitates calling a halt to the exploitation which has taken place in the past in the growing of this crop.

Livestock

Pigs.—In Penang the market for pigs has improved considerably, prices reaching \$15 per picul liveweight. In Malacca on the other hand prices declined from \$14.50 to \$13 per picul. The reason for this decline in price is not clear as the price of pork in Malacca markets has not fallen.

Buffaloes.—Another pair of buffaloes has been purchased for the buffalo farm at Pulau Gadong Station, Malacca. Four newly calved cows are being milked regularly and their yield is gradually increasing. The cows are now quieter and easier to milk. The milk is being made into ghee which is reported to be of excellent quality.

Ipoh Dairy Farm.—In an endeavour to find additional grazing land outside the farm area, an aerial survey of the environs of Ipoh was carried out by the Agricultural Officer. The only possible land available is situated some 12 miles outside the town.

Statistical. MARKET PRICES.

May 1939.

Major Crops.

Rubber.—There was a definite improvement in values during May, and the Singapore market rose by $1\frac{1}{4}$ cents per lb. from $27\frac{1}{4}$ cents at opening to 29 cents at the close. The average of daily quotations for No. 1. X. Ribbed Smoked Sheet was 27.88 cents per lb., as compared with 27.22 cents in April. The London average price was 8 pence and New York 15.95 cents gold, as compared with 7.93 pence and 15.78 cents gold in April.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.
Weekly Prices Paid by Local Dealers for Small-Holders' Rubber,
May, 1939.

(Dollars per picul of 133 $\frac{1}{3}$ lbs.)

Grades	Kuala Kangsar, Perak			Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.			
	10	17	31	4	18	25	3	10	17	31
Smoked Sheet ...	34.00	35.50	36.00	—	—	—	—	34.10	—	—
Unsmoked Sheet ...	—	—	—	33.00	33.00	33.50	32.47	33.25	33.60	35.00
Scrap ...	No purchases									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$3.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Pilah on the 11th, at Batu Pahat on the 24th, and at Kuala Kangsar on the 3rd and 24th May.

Palm Oil.—Prices improved slightly during May, and the month's quotations are given in Table II. The averages of the April weekly quotations were:—palm oil £13.1.2, kernels £8.12.6.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
May 5	£ 13. 2. 6 Liverpool	£ 8. 12. 6 Rotterdam
" 12	13. 2. 6 "	9. 0. 0 London
" 19	13. 10. 0 "	9. 0. 0 "
" 26	13. 5. 0 Canada	9. 0. 0 Hamburg
Average	£ 13. 2. 6	£ 8. 18. 2

Copra.—Values improved during May. The sun-dried grade rose from \$3.50 per picul at opening to \$3.90 on the 11th and 12th, weakening slightly in the second half of the month and closing at \$3.85. The Singapore average price for the month of this grade was \$3.75 per picul, as compared with \$3.47 in April, and the mixed grade continued to be quoted at 30 cents per picul lower.

Copra cake remained unchanged at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in April were as follows:—Siam No. 2 Ordinary \$3.71, Rangoon No. 1 \$3.17, Saigon No. 1 \$3.42, as compared with \$4.06, \$3.17 and \$3.47 in March, and with \$3.98, \$3.62 and \$3.85 in April 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were: Singapore 26, Penang 32, Malacca 28, and were unchanged from March.

The average declared trade value of imports during April was \$3.72 per picul, as compared with \$3.76 in March and \$3.68 in February.

Padi.—Prices of padi per 100 gantangs (gallons) ranged from \$8 to \$12 in most parts of the country. In Kedah the range was \$7.70 to \$8.40; in Johore \$10 to \$11; and in Malacca \$9 to \$10. In Province Wellesley the price was \$8.80.

The prices paid by the Government Rice Mills during May remained unchanged: Bagan Serai, Perak, \$2.20; Parit Buntar, Perak, \$2.10; Temerloh, Pahang, \$2.20.

Pineapples.—The Central Board of Packers raised the prices of all canned pineapples in the first half of May. The new prices, per case of 48 cans of 1½ lbs. each are as follows:—G.A.Q.: Sliced Flat \$3.20, Sliced Tall \$3.35, Cubes \$3.25; Golden \$3.60, \$3.75 and \$3.65 respectively.

Fresh fruit prices per 100 were as follows:—Singapore 90 cents to \$1.70; Selangor 58 to 80 cents; Johore, 1st quality \$1.05 to \$2.20, 2nd quality 70 cents to \$1.20, 3rd quality 50 cents to \$1.

Beverages.

Tea.—During May three consignments of Malayan highland tea, comprising 240 packages, were sold on the London market at prices ranging from 1s.3d. to 1s.3½d per lb., the average being 1s.3.42d. Four consignments of lowland tea, comprising 294 packages, were sold at prices ranging from 11¼d. to 1s.0¾d. per lb., the average price being 1s.0¼d.

The average London prices per lb. realized for tea from other countries, according to the *Tea Market Reports* for May of the Tea Brokers' Association of London, were as follows:—Ceylon 1s.3.89d., Java 1s.2d., Indian Northern 1s.1.17d., Indian Southern 1s.3.35d., Sumatra 11.53d.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 30th May, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 75, Medium Grown Teas 68, Low Grown Teas 65.

Coffee.—Liberian coffee continued unchanged at \$14.50 per picul. Excelsa improved from \$10.25 to \$10.50 per picul, and Robusta improved from \$6.50 to \$6.75 per picul.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$11.34 to \$12.51 per picul, and for Sourabaya coffee \$8.31 to \$9.81, the price within these ranges depending upon quality.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$7.20, Medium \$6.76, Mixed \$6.15.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.50 to \$6.65; Red Whole \$5.19 to \$6.69; Sliced \$7.62 to \$9.62; as compared with \$4.62 to \$6.65, \$5.06 to \$6.80, and \$9.44 to \$12.81 respectively in April.

Pepper.—There was a slight rise in prices during May. Singapore Black continued at the April closing price of \$8 per picul. Singapore White averaged \$12.44, and Muntok White \$12.69. The April average prices were \$8.12, \$12.40 and \$12.65 respectively.

Nutmegs.—Both 110's and 80's continued unchanged at \$28 per picul. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Prices continued unchanged: Siouw \$85 per picul (nominal), Amboina \$58 per picul. Locally produced mace, dry, was sold in Penang at \$70 per picul.

Cloves.—Nominal quotations in Singapore continued unchanged: \$40 per picul for both Zanzibar and Amboina. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* for 29th May, 1939, from Rs. 1.10 to Rs. 1.20 per lb.

Miscellaneous.

Derris.—Fair quantities of root were available during May. Singapore prices remained practically unchanged: \$7.50 to \$9 per picul for roots sold on a basis of ether extract; \$17.50 to \$18.50 per picul for roots sold on rotenone content.

Gambier.—Block was quoted throughout the month at \$8 (nominal) per picul, and No. 1 Cube improved to \$17 per picul, as compared with April averages of \$7.40 and \$15.40 respectively.

Sago.—Pearl averaged \$4.28 per picul in May, and Flour, Sarawak Fair, averaged \$2.54, as compared with \$4.01 and \$2.52 respectively in April.

Tapioca.—Prices of all grades improved during May. Flake Fair rose to \$4.30 per picul, averaging \$4.18; Seed Pearl rose to \$5, averaging \$4.81; and Pearl Medium rose to \$5, averaging \$4.94 per picul. The April average prices were \$3.85, \$3.94 and \$4.50 respectively.

Tobacco.—Kelantan prices of prepared tobacco were lower during May and were, per picul:—1st quality \$127, 2nd quality \$87, 3rd quality \$67. The general range of the three grades in other parts of the country was:—\$16 to \$25; \$10 to \$23; \$5 to \$14. In Kedah the range was \$32 to \$40; \$20 to \$25; \$13 to \$18; and in Penang and Province Wellesley \$34; \$30; \$20. In Malacca prices ranged from \$17 to \$20, and in Johore \$9 to \$23 for dried leaf, and \$40 to \$112 for prepared tobacco.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 Picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY *

April, 1939.

Malaya.—Imports of foreign rice during April were 59,210 tons,† and exports 8,837 tons. Net imports were accordingly 50,373 tons, as compared with 51,747 tons in 1938.¶

Of the April imports 37 per cent. were consigned to Singapore, 22 per cent. to Penang, 6 per cent. to Malacca, 28 per cent. to the Federated Malay States, and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 33,935 (57.3), Burma 21,535 (36.4), French Indo-China 2,210 (3.7), other countries 1,530 (2.6).

Of the exports during April 73 per cent. were consigned to the Netherlands Indies and 27 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 7,851 (88.8), Burma 743 (8.4), French Indo-China 172 (2.0), parboiled 46 (0.5), Malayan production 25 (0.3).

April net imports by countries of origin were (in tons, percentages in brackets):—Siam 26,084 (51.8), Burma 20,792 (41.3), French Indo-China 2,038 (4.0), elsewhere 1,459 (2.9).

India.—Foreign exports during the first quarter of the year were 81,000 tons, as compared with 61,000 in 1938, an increase of 32.8 per cent. Of these exports 3.7 (4.9) per cent. were to the United Kingdom, 1.2 (8.2) per cent. to the Continent of Europe, 37.0 (44.3) per cent. to Ceylon, 5.0 (4.9) per cent. to the Straits Settlements and the Far East, and 53.1 (37.7) per cent. to other countries. The percentages in brackets are for the corresponding period in 1938.

Burma.—Foreign exports from the 1st January to 26th April totalled 1,600,083 tons, as compared with 1,336,790 in 1938, an increase of 19.7 per cent. Of these exports 58.2 (43.9) per cent. were to India, 6.4 (9.1) per cent. to the United Kingdom, 5.7 (6.7) per cent. to the Continent of Europe, 8.7 (10.7) per cent. to Ceylon, 7.9 (13.5) per cent. to the Straits Settlements and the Far East, and 13.1 (16.1) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average April prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 224, Small Mills Specials 228.

Siam.—Exports of rice and rice products from Bangkok during January were 131,590 tons, as compared with 113,954 tons in 1938.

Japan.—The latest information available was published in the February Summary.

French Indo-China.—Entries of padi into Cholon during the first four months of the year totalled 808,529 tons, as compared with 518,565 tons in 1938, an increase

* Abridged from the Rice Summary for April 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

of 55.9 per cent. Exports of rice during the same period were 708,650 tons, as compared with 494,319 tons in 1938, an increase of 43.4 per cent.

The Saigon rice and padi market was active during March and prices tended to rise. Prices opened at \$2.77, rose to \$2.87, fell to \$2.77, and closed at \$2.79 per picul. The price of padi rose from \$1.73 to \$1.82, closing at \$1.80 per picul.

The Netherlands Indies.—The latest information available was published in the March Summary.

Ceylon.—Imports during the first four months of the year totalled 206,178 tons, as compared with 183,572 tons in 1938, an increase of 12.3 per cent. Of these imports 14.7 (15.6) per cent. were from British India, 64.2 (73.6) per cent. from Burma, 0.5 (0.5) per cent. from the Straits Settlements, and 20.6 (10.3) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 14th April totalled 461,451 tons, as compared with 313,756 tons in 1938, an increase of 47.1 per cent. Of these shipments 43.0 (56.6) per cent. were from Burma, 45.4 (34.1) per cent. from Saigon, 10.4 (6.2) per cent. from Siam, and 1.2 (3.1) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments from the Levant from 1st January to 12th April totalled 8,433 tons, as compared with 6,671 tons in 1938, an increase of 26.4 per cent. Shipments for Cuba, West Indies and America from 1st January to 13th April were 72,005 tons, as compared with 62,560 tons in 1938, an increase of 15.1 per cent.

FERTILIZER PRICES, MAY, 1939.

The following are the prices at the end of May, 1939, of some of the more important fertilizers.

more important fertilizers.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	80.00
Muriate of Potash	...	—	—	50	112.00
Sulphate of Potash	...	—	—	48	112.00
Superphosphate (concentrated)	...	—	39	—	105.00
Superphosphate	...	—	—	—	60.00
Basic Slag	...	—	16	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	40.00
Lime	...	—	—	—	20.00

* Citric soluble. ‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1939.

PRODUCT.	Net Exports in Tons				
	Year 1938	Jan./Mar. 1938	Jan./Mar. 1939	March 1938	March 1939
Arecanuts ...	33,769	11,331	10,588	4,450	2,731
Coconuts fresh†† ...	116,743†	22,745†	24,862†	10,734†	9,135†
Coconut oil‡ ...	49,140	11,505	12,993	4,613	4,331
Copra‡ ...	68,754	10,140	3,707	3,403	2,612
Copra cake ...	7,112	1,603	1,853	920	949
Gambier, all kinds ...	1,632	425	618	180	195
Palm kernels ...	9,359	2,176	2,824	1,005	816
Palm oil ...	54,377	12,950	12,078	5,691	5,459
Pineapples, canned ...	73,168	20,211	18,987	8,767	7,616
Rubber¶ ...	360,898¶	108,455¶	78,762¶	35,972¶	21,214¶
Sago,—flour ...	4,537	2,520	2,316	2,014	456
„ —pearl ...	4,203	962	796	323	360
„ —raw ...	5,088*	1,710*	888*	555*	362*
Tapioca,—flake ...	981	246	252	54	142
„ —flour ...	3,072*	858*	854*	252*	496*
„ —pearl ...	17,818	4,070	3,583	1,924	1,301
Derris ...	676	80	358	27	154
†Copra equivalent ...	150,944	29,291	25,318	11,114	9,882

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,159.6	2,082.2	4,241.8	423.4	346.0	769.4
Total ...	9,208.6	8,826.6	18,035.2	1,663.9	1,524.0	3,187.9
Total January to April, 1938 ...	8,605.4	5,732.0	14,337.4	1,554.5	1,055.0	2,609.5
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 30th April, 1939, were: palm oil 4,249 tons, palm kernels 580 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH APRIL, 1939.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acreage (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	43,111	1,855	4.3	15,805	36.7	521	1.2	17,660	41.0	25,451	59.0	7,582	17.6
Malacca ...	120,462	5,757	4.8	37,006	30.7	2,160	1.8	42,763	35.5	77,699	64.5	24,340	20.2
Penang ...	2,479	—	—	1,184	47.8	9	0.4	1,184	47.8	1,295	52.2	60	2.4
Singapore ...	32,108	6,701	20.9	9,628	30.0	135	0.4	16,329	50.9	15,779	49.1	3,553	11.1
Total S.S. ...	198,160	14,313	7.2	63,623	32.1	2,825	1.4	77,936	39.3	120,224	60.7	35,535	17.9
F. M. S.—													
Perak ...	285,572	12,698	4.5	79,984	28.0	8,189	2.9	92,682	32.5	192,890	67.5	48,931	17.1
Selangor ...	319,141	26,502	8.3	74,352	23.3	7,345	2.3	100,854	31.6	218,287	68.4	53,682	16.8
Negri Sembilan ...	264,281	20,502	7.8	78,560	29.7	16,711	6.3	99,062	37.5	165,219	62.5	43,557	16.5
Pahang ...	85,777	5,064	5.9	27,990	32.6	5,733	6.7	33,054	38.5	52,723	61.5	9,765	11.4
Total F.M.S. ...	954,771	64,766	6.8	260,886	27.3	37,978	4.0	325,652	34.1	629,119	65.9	155,935	16.3
U. M. S.—													
Johore ...	481,762	24,413	5.0	142,987	29.7	37,558	7.8	167,400	34.7	314,362	65.3	74,196	15.4
Kedah ...	194,977	9,772	5.0	35,247	18.1	6,407	3.3	45,019	23.1	149,958	76.9	43,758	22.4
Kelantan ...	31,223	403	1.3	7,940	25.4	2,423	7.8	8,343	26.7	22,880	73.3	5,506	17.6
Trengganu (d) ...	4,817	nil	nil	49	1.0	nil	nil	49	1.0	4,768	99.0	1,651	34.3
Perlis (e) ...	1,459	458	31.4	239	16.4	155	10.6	697	47.8	762	52.2	294	20.2
Brunei ...	6,080	nil	nil	3,646	60.0	316	5.2	3,646	60.0	2,434	40.0	1,096	18.0
Total U.M.S. ...	720,318	35,046	4.9	190,108	26.4	46,859	6.5	225,154	31.3	495,164	68.7	126,501	17.6
Total MALAYA ...	1,873,249	114,125	6.1	514,617	27.5	87,662	4.7	628,742	33.6	1,244,507	66.4	317,971	17.0

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

Table compiled from the Rubber Survey, 1939.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF APRIL, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1		Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2	Imports			Exports including re-exports during the month			Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to April 1939	during the month	From Malay States & Labuan	From Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to April 1939
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Federated Malay States	...	3,220	28,702	8,078	27,058	5,867	16,742	Nil	Nil	Nil	Nil	10,939	4,343	45,301	9,497	5,309
Johore	...	1,844	10,819	3,768	16,752	3,993	10,581	Nil	31	Nil	137	2,404	5,288	10,328	17,262	2,367
Kedah	...	124	5,984	2,211	9,139	897	2,844	Nil	Nil	Nil	Nil	1,594	1,980	5,567	6,748	299
Perlis	...	...	9	35	4	29	82	Nil	Nil	Nil	Nil	Nil	Nil	28	24	25
Kelantan	...	442	781	230	1,112	775	2,228	Nil	Nil	Nil	Nil	461	618	1,197	2,082	649
Trengganu	...	3	339	131	486	325	878	Nil	Nil	Nil	Nil	Nil	486	Nil	47	285
Brunei	...	Nil	97	15	123	84	240	...	...	...	...	...	117	Nil	15	64
Total Malay States	...	5,642	46,777	14,437	64,699	11,270	33,595	Nil	31	Nil	137	15,238	12,860	62,393	37,450	8,710
S. SETTLEMENTS:—	...	1,322	2,471	850	3,587	500	1,831	Nil	Nil	Nil	Nil	2,011	...	8,616	1,849	2,260
Malacca Wellesley	...	545	986	306	1,284	155	568	Nil	Nil	Nil	37,504	5,440	...	23,678	486	888
Penang	704	2,748	8	15	59	48	228	1,247	10,994	10,287	50,481	20,866	...	78,616	1,496	1,942
Singapore	3,184	16,633	244	91	384	15	189	12,603	...	201	...	Nil	...	15,669	3,328	280
Labuan	...	10	Nil	Nil	...	8	33	46	...	...	...	...	...	18	Nil	Nil
Total Straits Settlements	3,888	21,258	2,709	1,262	5,314	756	2,849	13,996	10,994	60,969	37,504	28,320	Nil	110,240	4,834	19,464
Total Malaya	3,888	26,900	50,486	15,699	70,013	11,996	36,444	13,996	11,025	60,969	37,731	43,658	12,860	173,333	4,834	28,174

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S. State	Penang	Province Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	4,061	15,299	1,960	1,643	1,808	169
WET RUBBER	618	370	82	225	559	130
TOTAL	5,309	15,669	1,942	1,868	2,367	299

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to April 1939
Singapore	30,384	119,228
Penang	8,836	27,381
Port Swettenham	4,438	16,214
Malacca	Nil	510
MALAYA	43,658	173,333

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to April 1939
Malay States	28,189	99,687
Straits Settlements	2,075	8,138
MALAYA	30,264	107,825

- Notes:—**
- Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 - The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e. Column [7] = Columns [13] + [14] + [17] + [19] + [20] + [21] + [22] - [13] - [14] - [15] - [16] - [18] - [19] - [20] - [21] - [22]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by census paid.
 - Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 - Columns (33) and (34) represent exports of rubber subject to re-ignition which, for Singapore and Penang Islands are represented by sales or exports as shown by census paid.
 - All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore is always the most reliable.
 - The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25th May, 1939.

METEOROLOGICAL SUMMARY, MALAYA, APRIL, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.					
	Means of		A and B		Absolute Extremes		At 1 foot	At 4 feet	Total.		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.		
	A.	B.	Max.	Min.	Highest	Lowest			Max.	Min.		in.	mm.	Precipitation at or more	Thunder-storm				Fog morning obs.	Gale force 8 or more
	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.				hrs.	hrs.				
Railway Hill, Kuala Lumpur, Selangor	91.3	72.9	82.1	95	69	85	76	84.7	85.1	7.30	185.4	1.55	21	17	9	6	—	190.30	6.34	52
Bukit Jeram, Selangor	90.1	73.1	81.6	93	70	85	76	85.5	87.2	4.54	115.3	0.98	18	17	—	1	—	233.40	7.78	64
Sitiawan, Perak	89.5	73.8	81.7	92	70	86	77	84.6	84.8	8.47	215.1	2.66	19	17	3	—	1	212.80	7.09	58
Ipoh Aerodrome, Perak	90.5	73.4	81.9	94	71	83	76	84.2	84.5	11.80	299.7	3.27	21	20	9	—	—	192.15	6.41	53
Temerloh, Pahang	89.6	73.2	81.4	95	70	77	76	85.5	86.2	6.93	176.0	1.15	20	17	3	10	—	185.40	6.18	51
Kuala Lipis, Pahang	89.7	72.1	80.9	94	69	76	75	84.4	84.6	5.28	134.1	2.17	19	13	6	30	—	184.05	6.13	50
Kuala Pahang, Pahang	86.6	74.7	80.7	91	72	76	77	86.1	86.3	13.52	343.4	3.99	13	11	1	—	—	227.45	7.58	62
Kallang Aerodrome, S'pore	86.9	76.0	81.5	91	73	79	79	83.0	83.7	8.73	221.7	3.14	16	16	3	—	—	173.65	5.79	47
Bayan Lepas Aerodrome Penang	87.9	75.1	81.5	90	73	82	77	85.4	85.7	10.45	265.4	2.61	23	17	7	—	1	217.95	7.27	59
Malacca Town, Malacca	86.9	73.9	80.4	91	71	84	77	84.3	85.1	5.29	134.4	1.40	15	13	10	—	2	204.40	6.81	56
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Labuan	87.6	76.3	81.9	92	72	78	81	87.3	87.8	12.64	321.1	4.66	13	10	1	—	—	246.65	8.22	67
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Cameron Highlands, Tanah Rata, Pahang 4750 ft.	73.5	58.0	65.7	77	50	67	63	70.4	69.2	8.50	215.9	1.29	24	22	3	4	—	142.45	4.75	39
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exertion in this operation. We publish in this number a short article describing a preliminary attempt to measure this threshing character of the more important Kedah varieties; the mechanical device described can in addition be used for estimating the shattering character of padi, *i.e.* its tendency to loss of grain during the ordinary operations of harvesting.

An Out-of-Season Padi Trial.

An article in this number describes an attempt to ascertain whether, in a locality on the Perak River, a satisfactory crop of padi could be produced between the months of January and July instead of during the normal season July to March.

The locality in question had previously depended solely on rainfall for the growth of the crop, no irrigation by gravitation being possible. A scheme had been designed to provide irrigation by pumping from the Perak River and it was obvious that a considerable saving in respect of capital expenditure and maintenance charges would be made if it could be arranged that the padi season for one half the area should be from July to March, and for the other half January to July. Rainfall graphs indicated that approximately the same total rainfall might be expected to fall in each of these two periods, though the incidence differed. The scheme as proposed, however, provided for adequate irrigation to each half of the area in order that the crop should not suffer during the comparatively dry periods within each of the projected seasons.

It is axiomatic under temperate conditions that an annual plant requires to be grown in its proper season, and that temperature and the length of day are the major features involved. It is not so obvious that the question of season may also have to be taken into account in the equatorial regions, where these factors are not subject to the marked variations encountered in temperate countries, especially when other growth requirements, such as adequate moisture, can be provided. Even a slight acquaintance with the problems connected with padi cultivation, however, gives rise to the conviction that the rice plant is particularly sensitive to environment in many respects, and before advocating that certain of the padi cultivators in the particular area should change their usual season it was deemed necessary to determine by experiment if the change was in fact an economic possibility.

The experiment described proved that in the locality concerned a satisfactory crop of padi cannot be expected if grown in the January to July season. The reason for this lies outside the design of the experiment, but the latter gave rise to strong indications that the influence of season may be more closely related to the incidence of pest than to a direct effect on the plant itself. These indications receive some confirmation from additional experiments conducted by the Entomological Division of this Department.

Original Articles.

PLANTING OF ROADSIDE TREES IN MALAYA

BY
B. BUNTING,
Senior Agriculturist.

Introductory.

In the lay-out of modern towns and villages methods of planning allow for wider streets and approach roads, also open spaces, all of which can be made more attractive by the planting of trees.

The selection, method of planting and subsequent treatment of roadside trees have accordingly become matters of considerable importance during the past few years and the following information may prove of value to those who are connected with these undertakings.

Selection of Trees.

In selecting suitable trees for shading streets and roadsides a large number of conditions require consideration. The essential qualities of a good shade tree are as follows:—

- (i) It should be evergreen or, if deciduous, it should produce new foliage soon after losing the old leaves.
- (ii) A good spreading head of strong branches, with a clean upright stem for at least 12 feet from the ground.
- (iii) A somewhat restricted root system so as not to break up drains and footpaths.
- (iv) It should be a fairly fast grower.
- (v) The leaves should be as small as possible and preferably have the habit of closing up at night.

Trees which produce much litter, or those with large leaves and heavy fruits, should be rejected, while many trees of rapid growth produce either soft or brittle wood and are usually short-lived.

In narrow streets it is not practicable to plant trees with spreading branches, but there are several evergreen kinds with an upright cylindrical or pyramidal form which make them specially suited for confined situations.

Several shade trees, especially leguminous ones, *e.g.* rain tree, have the habit of closing up their foliage at night or in dull cloudy weather, thus allowing a free circulation of air when planted near buildings.

The shape and size of most shade trees can be controlled by systematic pruning; as a rule the slow-growing hard-wooded trees are able to withstand pruning better than the quick-growing, soft-wooded species.

The trees and palms recommended as most suitable for planting on roadsides and in open spaces are grouped for convenience under the following headings:—

- (a) Shade trees.
- (b) Avenue trees.
- (c) Ornamental palms.

It should be pointed out that the individual members in each group have been arranged alphabetically according to their botanical names and have not been placed in an order of merit.

Further, the measurements of both height and spread in the descriptions of the various trees and palms refer to their development in Malaya and bear no comparison to their size in their native habitats.

In this connexion it should be pointed out that the spread of a tree refers to the horizontal distance from the trunk to the tip of the longest branch; in other words the spread represents the radius of the circle of ground occupied by the tree.

To facilitate reference, the measurements of height, spread, and planting distance have also been summarized in Appendix 'A'.

(a) Shade Trees.

The trees described under this heading are considered to be the most suitable for providing roadside shade as they have a spreading habit of growth, which produces the maximum amount of shade.

(1) *Albizzia falcata* (Leguminosae), Batai.

A large, very quick-growing, soft-wooded tree attaining a height of over 100 feet. This is one of the quickest growing trees in Malaya, but its fine feathery foliage does not provide very heavy shade. The spread of the branches from the trunk is from 50 to 60 feet and the trees should be planted from 100 to 120 feet apart. Alternatively, the trees may be planted from 50 to 60 feet apart with a view to cutting out every alternate tree later. A drawback to this tree is that its wood is very soft and the branches are apt to break and fall off without any warning. The tree is also known under the botanical name of *A. moluccana*.

(2) *Delonix regia* (Leguminosae), Flame-tree and Flamboyant, but often known in Malaya as Flame of the Forest.*

A beautiful tree, with scarlet or orange-yellow flowers and fine feathery foliage, native of Madagascar. It is not a very rapid grower, but attains a height of 40 to 50 feet when mature. The tree has a spreading habit and the branches may spread from 30 to 40 feet from the trunk. It is frequently necessary to cut back some of the long thin branches in order to improve the shape of the crown, but fortunately the tree is able to withstand light pruning. For roadside purposes the trees should be planted at a distance of 60 to 70 feet apart. In view of its spreading

* The original flame of the forest tree is *Butea frondosa* (Leguminosae). This tree is a native of India and Ceylon.

habit, it requires a wide thoroughfare to show off its beauty. It is one of the most ornamental trees in the tropics and will thrive both in wet and dry regions. This flowering tree was formerly known as *Poinciana regia*.

(3) *Enterolobium saman* (Leguminosae), Rain Tree. (Plate I).

This is a large, quick-growing tree, native of tropical America. It often attains a height of over 100 feet and is very long-lived. Its wide spreading habit produces very good shade and it is therefore an excellent tree for roadside purposes. It requires a certain amount of pruning, however, to improve its shape and this may reduce the ultimate height of the tree. To prevent the development of very large branches, the tree should be cut across the crown at a height of about 12 to 15 feet, but this operation will naturally restrict the spread of the crown. The spread of the branches of old trees from the trunk may eventually reach from 50 to 60 feet, consequently the trees should be planted at least 50 to 60 feet apart and every alternate tree cut out as the spread of the branches increases with age. This will give a final spacing of 100 to 120 feet apart when the trees are mature. The small leaves, which form a dense shade during the daytime, have the habit of closing up at night. The tree has somewhat large spreading shallow roots which may cause damage to adjoining drains and footpaths if left unpruned.

The rain tree is undoubtedly the most widely planted roadside shade tree in Malaya and was formerly known botanically as *Pithecolobium saman*.

(4) *Mimusops elengi* (Sapotaceae), Bunga Tanjong.

A medium-sized flowering tree, attaining a height of 40 to 50 feet when fully grown, which was probably introduced from India. It produces white flowers which are fragrant, but not very showy. The tree is somewhat slow-growing and the wood is naturally hard as a result; consequently it is fairly free from attacks of "white ants." The spread of the branches from the trunk is from 25 to 30 feet and the trees should be planted about 50 to 60 feet apart for avenue purposes. It forms a well shaped, bushy crown in the early stages of growth, but on reaching maturity it is necessary to prune the branches so as to keep the crown more symmetrical. Although it is considered more suitable as an avenue tree it might also be employed as a roadside shade tree.

(5) *Muntingia calabura* (Tiliaceae), West Indian Cherry.

This is a small or medium-sized tree, rarely exceeding a height of 25 to 30 feet. The tree is a native of tropical America and was introduced into this country only about thirty years ago. The closely-leaved branches, which are at right angles to the trunk, give the crown an umbrella-shaped appearance. The spread of the branches from the trunk varies from 15 to 20 feet, so that the trees should be planted from 30 to 40 feet apart to prove effective. It is a very quick-growing tree and reaches maturity within about 4 years. It will, however, produce excellent shade

at a little over a year from planting, when the branches will have a spread of at least 8 to 10 feet from the trunk. When the trees are two years old all the lower branches should have been removed to a height of about 8 feet.

The edible pink fruits, which closely resemble a cherry, are formed in great profusion at certain times of the year and are liable to attract bats. The latter are particularly objectionable when the trees are planted near a house or public building as they are very apt to discolour the walls. On the other hand, this objection does not apply to native buildings made of corrugated iron, wood or *atap* and in such cases the tree is most popular and, moreover, very effective as a shade tree for this particular purpose.

(6) *Parkia javanica* (Leguminosae), Kedawang.

A huge, handsome, quick-growing tree, native of India and Burma. This tree, which thrives best in moist situations, often attains a height of over 80 feet. It has a clean trunk and beautiful feathery foliage. The spread of the branches from the trunk is from 30 to 40 feet and the most suitable spacing for the trees is from 60 to 80 feet for roadside purposes. This tree is also known under the name of *P. roxburghii*.

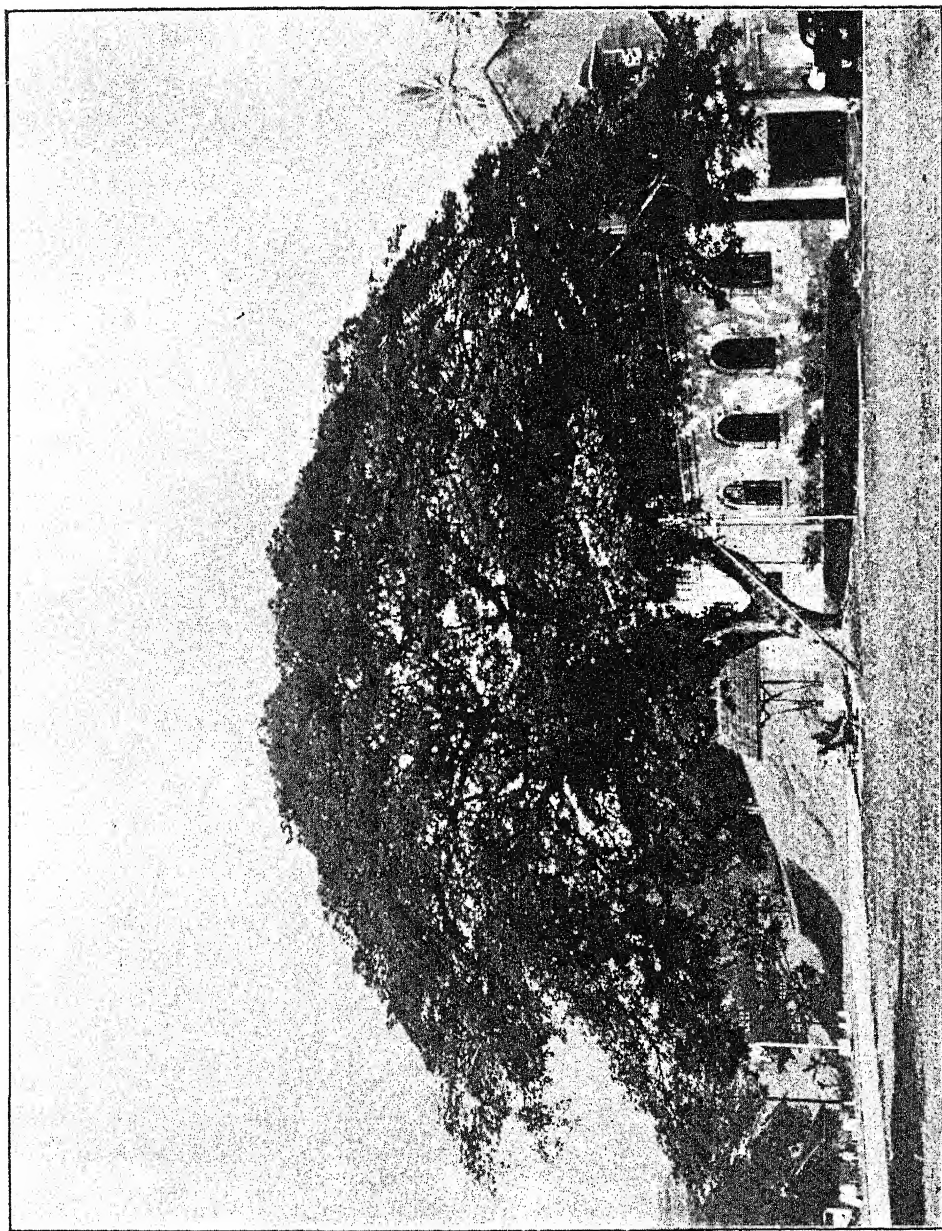
Another species, indigenous to Malaya, is *P. speciosa*, which is not so tall-growing as that described above.

(7) *Peltophorum pterocarpum* (Leguminosae), Batai. (Plate II).

This is a medium-sized, quick-growing flowering tree, indigenous to Malaya, reaching a height of about 40 to 50 ft. It is symmetrical in shape with a fairly wide spreading crown, which makes it very suitable as a roadside shade tree. The flowers are a rusty yellow colour and are borne in erect panicles. The tree generally blossoms twice a year at irregular intervals and it is not unusual to see one tree fruiting and another flowering at the same time. The feathery foliage gives the tree a very graceful appearance and this is further enhanced when the young leaves and shoots appear covered with a brown velvety tomentum. When fully grown it has a spread of about 25 to 30 feet from the trunk and consequently should be set back at least 15 feet from the edge of the road. Under good soil conditions the trees should be planted from 50 to 60 feet apart. The tree can withstand hard pruning and it is often necessary to cut off the lower branches, which may impede traffic on the road. It is a most handsome tree for wide thoroughfares and is suitable for cultivation in dry as well as in wet districts. The Malay name "Batai" is also applied to a few allied leguminous trees, and *Albizia falcata* bears the same local name. The tree was formerly known botanically as *P. ferrugineum*.

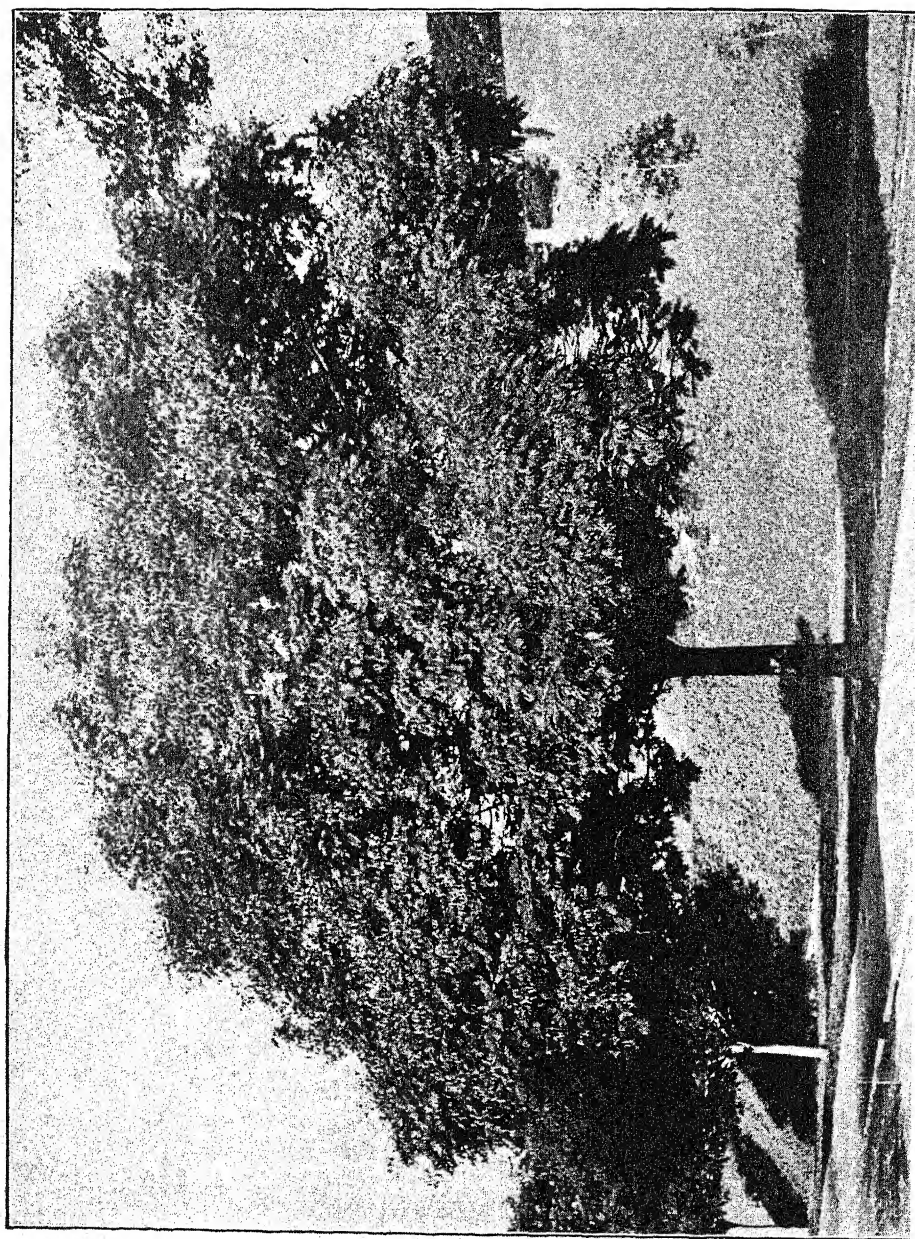
(8) *Pongamia pinnata* (Leguminosae), Indian Beech.

This is a medium-sized tree found growing principally in the coastal districts of Malaya, where it reaches a height of 50 to 60 feet. The glossy-green leaves are very small, and numerous, long, thin, leggy branches are produced in the crown.



Rain Tree (*Enterolobium saman*).

PLATE II.



Its shape can, however, be improved by periodic pruning, more particularly in the early stages of growth, when it should be restricted to a single shoot on the bole. The spread of the branches from the trunk is from 25 to 30 feet and the trees should be spaced about 50 to 60 feet apart when planted as roadside shade. The tree is evergreen and always produces shade during the severest drought. It was formerly named *P. glabra*.

(9) *Pterocarpus indicus* (Leguminosae), Angsana. (Plate III).

A tall-growing, handsome tree, native of India and Burma, attaining a height of 80 to 100 feet. It can be propagated either by seed or cuttings. The tree produces masses of bright yellow flowers, which make it most attractive as a roadside tree. The spread of the branches from the trunk of a well-developed Angsana may extend to as much as 50 to 60 feet and, therefore, the trees should be spaced from 100 to 120 feet apart when planted for shade purposes. Although the branches seldom break, a serious drawback is that the tree is liable to suffer from what is known as "Angsana disease," which frequently results in the death of affected trees. It is extensively planted as a roadside shade tree, but requires a deep well-drained soil for its proper development.

(10) *Tamarindus indica* (Leguminosae), Tamarind.

This is a handsome, tall-growing, erect tree sometimes reaching a height of 60 to 80 feet. It is symmetrical in shape with fine feathery foliage, which makes it most suitable as a roadside tree. It is a slow-growing, long-lived tree and is noted for its hard and beautifully marked red timber. The spread of the branches from the trunk is from 25 to 30 feet and the trees should be spaced from 50 to 60 feet apart for roadside planting. It is commonly planted as a roadside shade tree in India and is stated to thrive well in both moist and dry districts.

Recommendations for Shade Trees.

Of the above ten trees the Angsana, *Pterocarpus indicus*, and the rain tree, *Enterolobium saman*, are the most generally satisfactory for wide main thoroughfares provided there is plenty of space to enable the trees to be sited well back from the road edge and to allow unrestricted development of both stem and root. If planted near the edge of the road the roots of the rain tree are liable to cause unevenness of the road surface. There is some danger of the road surface being rendered slippery if wet weather occurs at the time the Angsana is shedding its flowers. *Albizia falcata*, though very suitable for providing a pleasant shade for wide roads, has brittle wood, so is not suited for main thoroughfares. For less wide roads or for wide roads where space is somewhat restricted or full shading of the road is undesirable, *Peltophorum pterocarpum* is a very suitable tree.

As many town authorities have experienced trouble with large specimens of Angsana and rain trees which have become dangerous to adjoining shop-houses, there is now a tendency to plant smaller-growing trees. *Peltophorum* has been

extensively planted recently and, when in flower, an avenue of this species forms a fine display. The Tamarind, *Tamarindus indica*, has a more sombre and therefore less pleasing general effect than *Peltophorum* and is of much slower growth. The Flamboyant (locally called Flame of the Forest) is often unsatisfactory in inland districts with a high rainfall and grows and flowers better in seaside areas or in comparatively dry regions.

(b) Avenue Trees.

The trees included in this group have, for the most part, an erect habit of growth and, therefore, are more useful for ornamental than for shade purposes.

(1) *Cassia fistula* (Leguminosae), Indian Laburnum.

A very handsome flowering tree of upright growth, native of India, attaining a height of 40 to 50 feet. It thrives best on rich loamy soils and in dry situations. It bears a profusion of bright yellow flowers in pendulous racemes, similar to the laburnum, and is deciduous. The spread of the branches from the trunk is from 15 to 20 feet and the trees should be planted at a distance of about 35 to 40 feet apart. It never forms a very large tree and is more suited for ornamental than for shade purposes.

(2) *Dryobalanops aromatica* (Dipterocarpeae), Borneo Camphor.

This is a lofty, erect-growing, conical-shaped tree, indigenous to Borneo and Sumatra, and under cultivation it attains a height of over 80 feet. Like tembusu, this tree has the habit of branching low down and requires pruning for roadside planting, particularly if there is a footpath nearby. The spread of a mature tree is from 15 to 20 feet from the trunk. The tree should be planted at a distance of 35 to 40 feet apart for roadside purposes. It is similar in habit of growth to the ironwood and, in view of its conical shape, does not produce much shade.

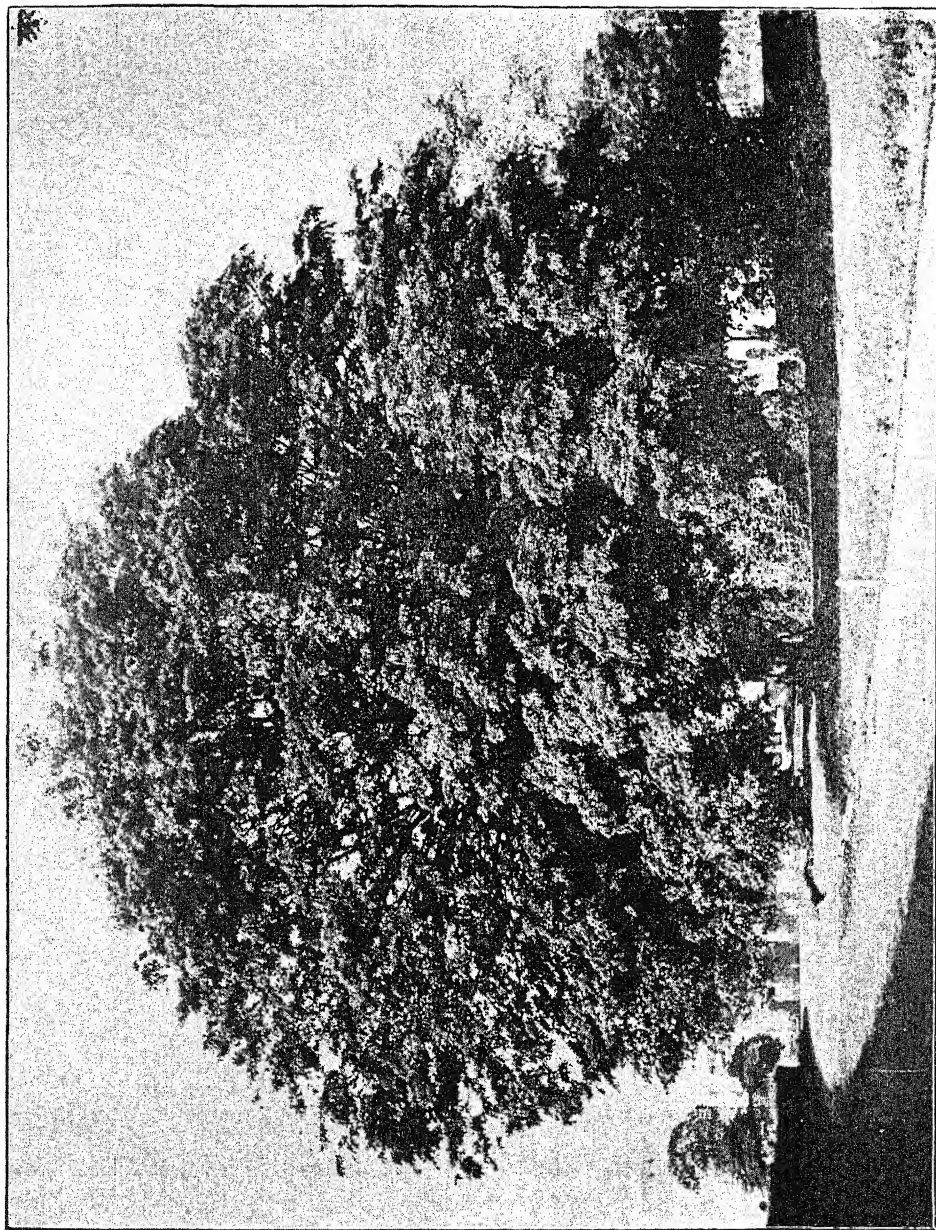
(3) *Eugenia grandis* (Myrtaceae), Jambu Ayer Laut.

This indigenous, tall, quick-growing tree reaches a height of about 70 to 80 feet and has an erect habit similar to the tulip tree. Although it is a quick-growing tree the wood is comparatively hard. The spread of the branches from the trunk varies from 15 to 20 feet and the trees should be spaced from 35 to 40 feet apart. For avenue purposes the main trunk should not be allowed to grow more than 40 to 50 feet high. It is an excellent roadside tree for dry sandy situations and is often found growing near the seaside, hence its Malay name.

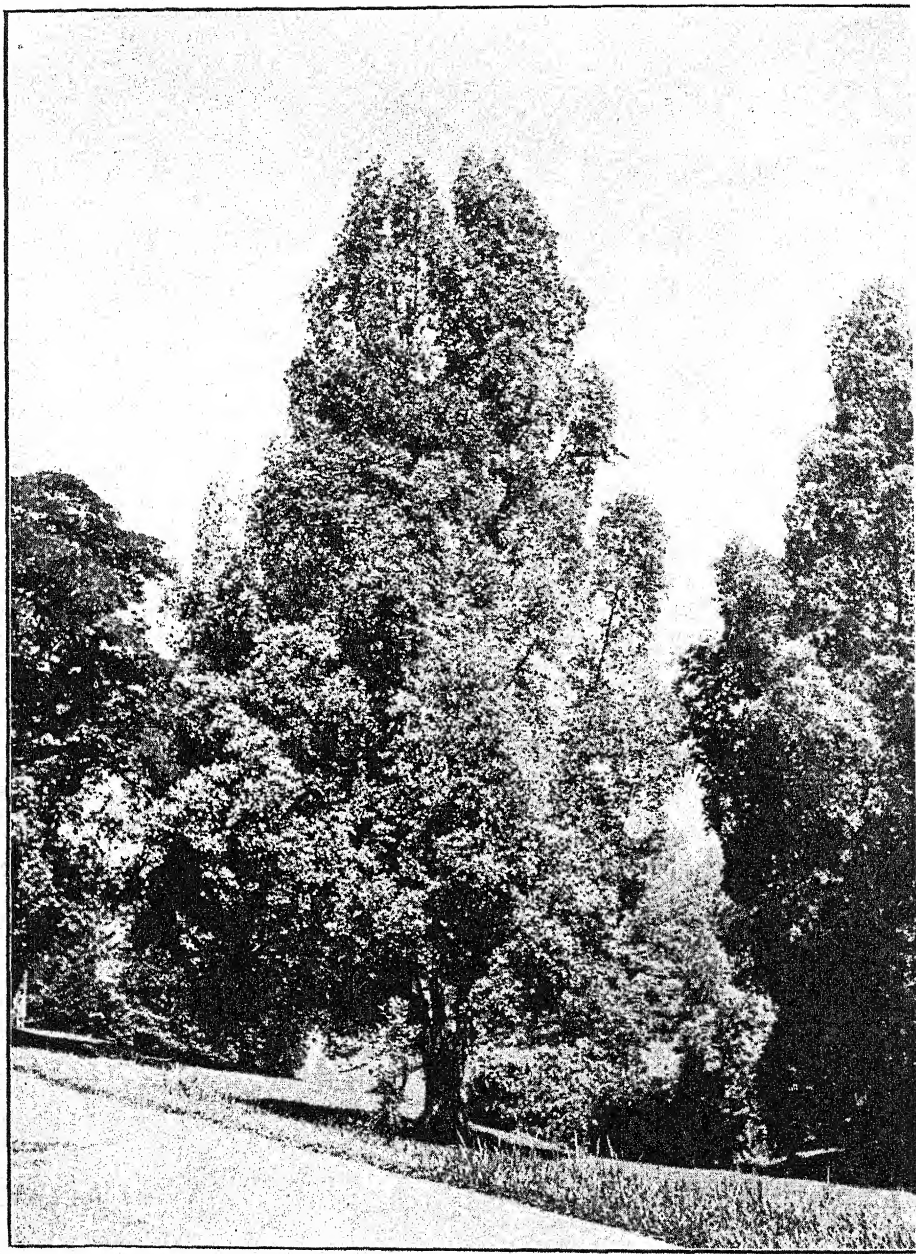
(4) *Fagraea cochinchinensis* (Loganiaceae), Tembusu. (Plate IV).

A handsome, upright, evergreen tree, indigenous to the Malay Peninsula, and very suitable for avenue planting. This tree, like the ironwood, has the habit of branching low down and, therefore, is more suited for wide roads. It is of a slow-

PLATE III.



Angsana (*Pterocarpus indicus*).



Tembusu. (*Fagraea cochinchinensis*).

growing nature and the wood is so hard that it does not suffer to any extent from "white ant" attacks. The small flowers are highly scented, the perfume somewhat resembling that of the honeysuckle. Under suitable conditions the tree attains a height of over 60 feet, and for roadside purposes it is advisable to top it when it reaches a height of about 40 feet. Fortunately the tree will stand hard pruning, so that it is easy to control its shape and size. The spread of the branches from the trunk is from 15 to 20 feet and the trees should be spaced from 35 to 40 feet apart when planted in an avenue. This tree is also known botanically as *F. fragans* and *Cyrtophyllum peregrinum*.

(5) *Grevillea robusta* (Proteaceae), Silky Oak.

This is a fairly tall-growing tree, native of southern Australia, and thrives quite well in dry situations in this country. The tree has an erect stem and attains a height of 60 to 70 feet. The fern-like foliage, which is silvery-white underneath, gives the tree a very ornamental appearance. The spread of the branches from the trunk is from 12 to 15 feet and the planting distance for these trees should not exceed 30 to 35 feet apart for avenue planting. Although it will grow on the plains in Malaya it is more suited for cultivation at higher elevations. Unfortunately, this tree is somewhat liable to attacks by "white ants."

(6) *Jacaranda mimosifolia* (Bignoniaceae), Jacaranda.

This beautiful flowering tree is a native of tropical America and reaches a height of 50 to 60 feet. It bears masses of bluish-purple, bell-shaped flowers, which are most attractive. Its fine feathery foliage gives only a medium shade and when the leaves fall in the hottest season the tree is absolutely bare and gives no shade at all. Unfortunately this tree generally has a bad bole and branches low down. It grows best in moist situations. The spread of the branches from the trunk is from 15 to 20 feet and the most suitable spacing for these trees is from 35 to 40 feet apart. The wood is fairly hard and the tree will stand hard pruning when necessary. This lovely flowering tree is also known as *J. ovalifolia*.

(7) *Lagerstroemia speciosa* (Lythraceae), Pride of India.

A fairly tall, spreading tree, native of India and Malaya, attaining a height of 50 to 60 feet. It is one of the most showy flowering trees and bears erect panicles of beautiful mauve or pink flowers from the ends of the branches. The pink flowering type is, however, very rare and mauve is the predominating colour. Although the tree is not so symmetrical as *Peltophorum*, its bright mauve flowers make it specially attractive. A slight drawback is that as the tree gets older it becomes deciduous for a short period during the dry season. As it is very slow-growing the wood is hard and therefore not subject to attacks of "white ants." The trees have a spread of 20 to 25 feet from the trunk and should be planted from 45 to 50 feet apart for roadside purposes. This tree is adapted for cultivation in wet or swampy localities and is therefore particularly suitable for planting in low-

lying situations. As stated above, it is indigenous to Malaya and is frequently found growing in jungle swamps in this country. The tree was formerly known as *L. flos-reginae*.

(8) *Melaleuca leucadendron* (Myrtaceae), Cajeput.

This graceful, erect tree is indigenous to Malaya, where it is found growing on both coasts. It has fine feathery foliage and fibrous, scaly bark, which peels off in large strips. The tree is variable in size, depending on soil conditions, but often attains a height of over 50 feet. It thrives best in wet situations and will even grow in standing water. The spread of the branches from the trunk may vary from 15 to 20 feet and when planted for avenue purposes the trees should be spaced from 35 to 40 feet apart. This tree has not sufficient spread to shade wide roads, but has been used with success as a shade tree on the narrow roads in Malacca.

(9) *Mesua ferrea* (Guttiferae), Ironwood. (Plate V).

A medium-sized, slow-growing, conical-shaped tree, indigenous to India and Malaya, attaining a height of over 80 feet. It has a symmetrical habit, but branches rather close to the ground. The young foliage, which is produced twice a year, is of a beautiful crimson colour and gives the tree a most striking appearance. The spread of the branches from the trunk is about 15 to 20 feet and when planted as an avenue tree it should be spaced about 35 to 40 feet apart. In view of its low-branching habit it is only suitable for very wide roads and should be set back at least 20 feet from the edge of the roadway. Since the tree is very slow-growing the timber is extremely hard, as its common name implies.

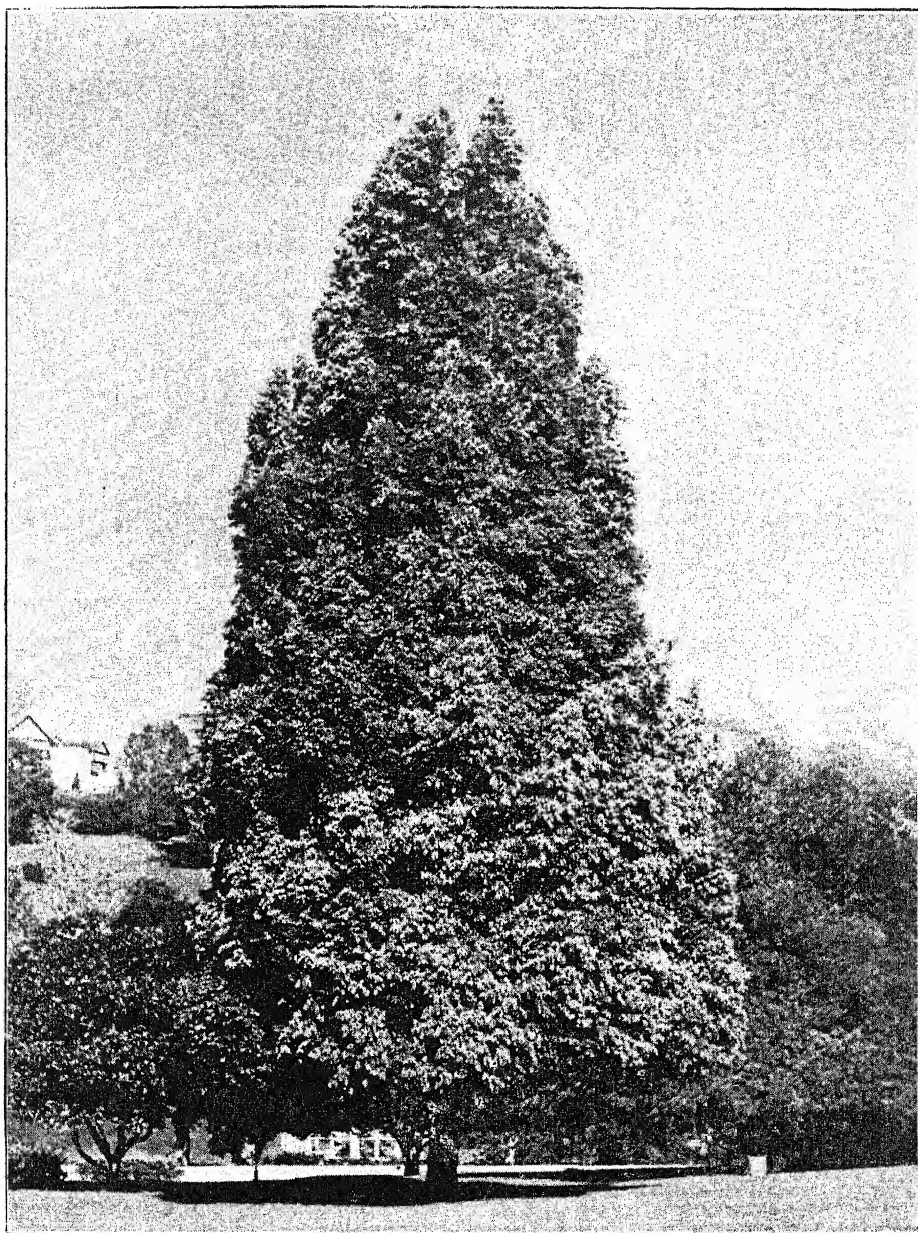
(10) *Spathodea campanulata* (Bignoniaceae), Tulip Tree.

A tall-growing, erect tree, native of tropical Africa, reaching a height of 70 to 80 feet. It is a free-flowering tree and its masses of orange-scarlet, cup-shaped flowers render it very ornamental. The spread of the branches from the trunk is from 15 to 20 feet and on account of its erect habit the tree does not produce much shade. A suitable planting distance is from 35 to 40 feet apart as an avenue tree. A serious objection is that the tree is soft-wooded and the trunks of old specimens are very liable to become hollow in the centre; consequently it is dangerous when growing near buildings or on roadsides when it is old.

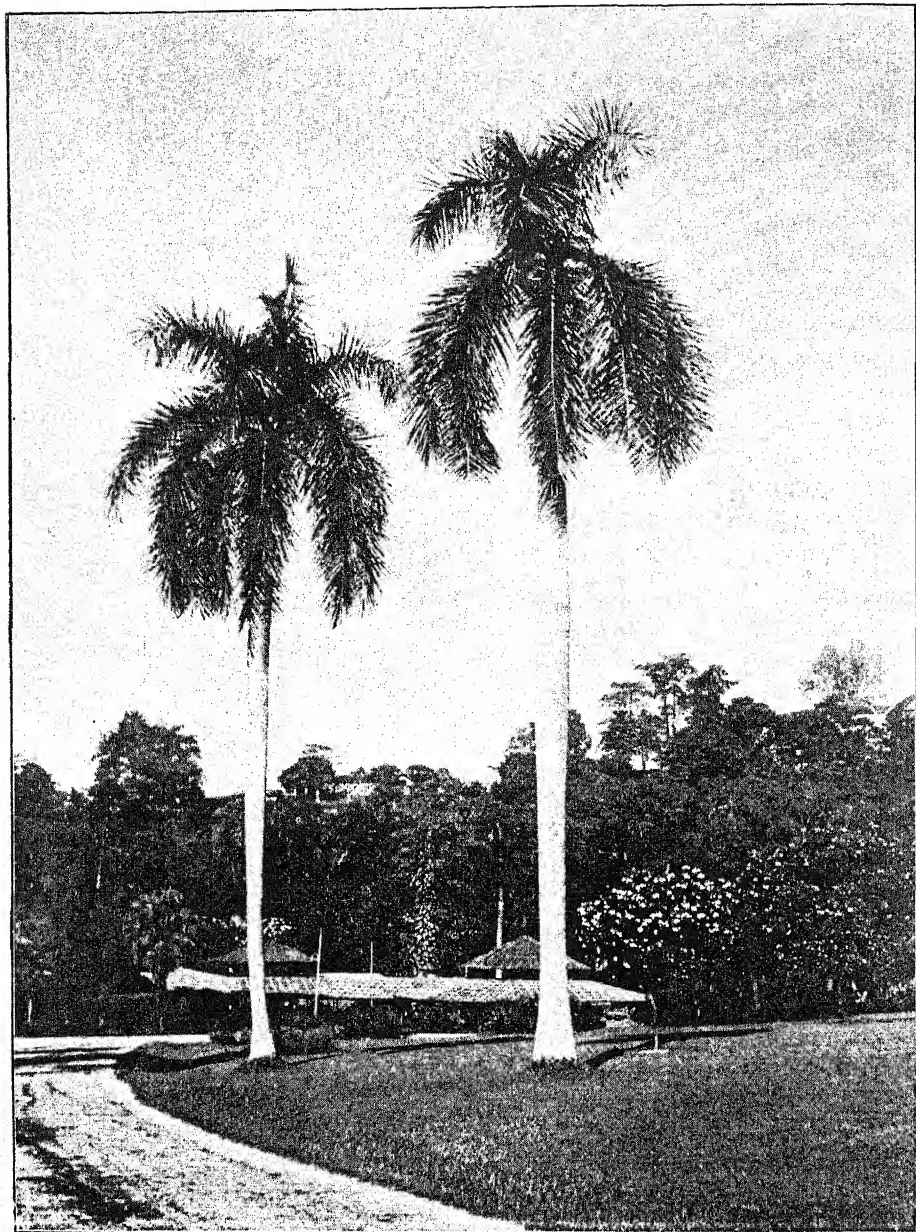
Recommendations for Avenue Trees.

The tembusu, *Fagraea cochinchinensis*, is one of the commonest ornamental trees in this group but is not entirely satisfactory as an avenue tree owing to its habit of branching. The tree forms branches widest at the base and thus a considerable amount of pruning is necessary. It grows well on the hardest clay soil and is most satisfactory in the open where the full beauty of its outline is shown.

The jacaranda, *Jacaranda mimosifolia*, thrives fairly well in the drier parts of the country but is erratic in its behaviour and rarely forms a uniform avenue of trees. The tulip tree, *Spathodea campanulata*, is often a striking tree and perhaps with



Ceylon Iron Wood (*Mesua ferrea*).



Royal Palm (*Roystonea regia*).

careful attention to branch pruning might be kept in better shape. *Eugenia grandis* was extensively planted as an avenue tree in Singapore in the past but does not appear to be so popular now. Several of the other trees mentioned have been experimentally planted during recent years but are as yet too young to decide whether they are suitable for the purpose.

(c) Ornamental Palms.

The palms grouped under this heading have upright, unbranched stems and most of them are naturally more suitable for ornamental purposes than for producing shade. They will, however, be found just as effective when planted in avenues as in open spaces.

(1) *Areca catechu* (Palmae), Arecanut or Betel-nut Palm, "Pinang."

This tall, graceful palm is indigenous to Malaya and produces the arecanuts of commerce. Its cultivation extends throughout tropical Asia. The palm has an erect, clean, solitary stem and often attains a height of 60 to 70 feet. The spread of the leaves varies from 4 to 6 feet from the stem, according to the variety. For ornamental purposes a suitable distance of planting arecanut palms is from 12 to 15 feet apart. It is an excellent palm for avenue planting and may live for 50 or 60 years under suitable soil conditions.

(2) *Arenga pinnata* (Palmae), Sugar Palm, "Kabong."

The sugar palm is also a native of the Malay Peninsula and has a stout, spineless trunk with long, rather upright, pinnate leaves, which often attain a length of 20 feet or more. This palm grows to a height of about 50 to 60 feet and, as its common name implies, it produces the dark brown native sugar, which is obtained by tapping the inflorescence in the same way as that practised for extracting toddy from the coconut palm. The leaves, which are more or less erect in their habit of growth, have a spread of about 15 to 18 feet from the trunk and the palms should be planted from 35 to 40 feet apart. As the tree is comparatively short-lived, usually only about 15 or 20 years, it is more useful for ornamental purposes in open spaces rather than for avenue planting. This palm was formerly known under the botanical name of *A. saccharifera*.

(3) *Borassus flabellifera* (Palmae), Palmyra Palm.

The palmyra palm is a native of India and tropical America and is occasionally planted in the Malay Peninsula as an ornamental palm. It has an erect, ringed stem and attains a height of 50 to 60 feet. The globe-shaped crown of fan-shaped leaves has a spread of 6 to 8 feet from the trunk and the most suitable distance for avenue planting of these palms is from 20 to 25 feet apart. The palm thrives best in very dry situations and requires a rich soil and good cultivation for its

proper development in the southern parts of the Malay Peninsula. It is a very slow-growing palm, but will live for 50 to 60 years. In India and Ceylon, this palm is extensively tapped for toddy in the same way as the coconut palm.

(4) *Caryota urens* (Palmae), Toddy or Wine Palm.

This handsome palm is indigenous to India and Ceylon and it is commonly cultivated in both these countries, where it is tapped for toddy in the same way as the coconut palm is in this country. The palm is also cultivated to some extent in gardens in Malaya. It is a tall palm with a stout, ringed trunk often reaching a height of 40 to 50 feet and has large ascending leaves from 15 to 18 feet long. The spread of the crown is about 12 to 15 feet from the trunk to the tip of the leaves. The distance of planting in avenues should be from 30 to 35 feet apart. The palm is comparatively short-lived and dies at the age of about 20 to 25 years.

(5) *Cocos nucifera* (Palmae), Coconut Palm, "Nyior" or "Kelapa."

The coconut palm is to be found cultivated in almost every part of the Peninsula and is too well known from the commercial standpoint to need much description. It is a very ornamental palm and grows to a height of 70 to 80 feet. The palm is principally cultivated for the production of the copra of commerce, which merely consists of drying the kernel, while in addition the unopened flower spathes are commonly tapped for the production of toddy. It has also many other uses in native industry. The great objection to planting this palm in avenues on streets or roadsides is the danger of nut fall, but this can be easily controlled by removing the flowering spathes as they develop. For ornamental purposes in open spaces the tall variety possibly has no equal. Its large drooping leaves, which vary from 20 to 25 feet in length, have a spread of 12 to 15 feet from the trunk. The most suitable distance of planting for these palms in avenues is from 30 to 35 feet apart, but when planting in groups of say seven or more the spacing should be reduced to 25 to 30 feet apart each way.

There are also three dwarf varieties with green, red and yellow fruits respectively, but the shape of these trees is not so beautiful as the tall type. The dwarf varieties should be planted at a distance of 25 to 30 feet apart to prove effective.

(6) *Cocos plumosa* (Palmae), Feathery Coconut Palm.

This particularly graceful palm is a native of Brazil and grows to a height of about 30 to 40 feet. It has an erect trunk, which is ringed at intervals of about 12 inches. Its fine feathery leaves, which have a drooping habit, spread only about 6 to 8 feet from the trunk and the best planting distance for these palms is from 20 to 25 feet apart. This is a fairly long-lived and comparatively quick-growing palm. It is preferred to the closely related *Cocos nucifera* for avenue planting from every standpoint, and is also excellent for ornamental purposes.

(7) *Corypha umbraculifera* (Palmae), Talipot or Fan-Palm.

This majestic palm is indigenous to Ceylon and South India and has enormous fan-shaped leaves measuring from 10 to 12 feet in diameter. It has a stout, erect, roughish stem 3 to 4 feet in diameter and grows to a height of 50 to 60 feet when mature. The spread of the leaves from the trunk to the tips is about 20 to 25 feet, and the palms should be spaced from 45 to 50 feet apart in the avenues. Owing to its large size this palm should only be planted where there are very wide road reserves. The palm usually flowers at about 30 to 35 years, after which it dies.

(8) *Cyrostachys lakka* (Palmae), Sealing-wax Palm, "Pinang-raja."

The sealing-wax palm is a native of Sumatra and Malaya and has multiple, spineless stems with bright red leaf-sheaths, which make it most attractive. The palms will grow to a height of 30 to 40 feet or even more under good soil conditions. The spread of the leaves from the centre of the palm varies from 6 to 8 feet, so that a good distance of planting these palms is from 20 to 25 feet apart. This palm is not very suitable for avenue planting on account of its numerous stems, but it is excellent for ornamental purposes in open spaces. Although it is to be found growing in swamp forests in different parts of the Peninsula the palm will thrive on drained flat land as well as on high ground.

(9) *Elaeis guineensis* (Palmae), Oil Palm.

This handsome palm is a native of tropical West Africa and is often referred to as the African oil palm. It attains a height of 60 to 70 feet and is now commonly grown in Malaya for its bright orange-red fruits, which produce the palm oil and palm kernels of commerce. The palm has a stout, erect stem and when the leaves are removed by pruning it is covered with numerous leaf bases. It has fine spreading leaves, which are often over 20 feet in length. The spread of the leaves from the trunk to the drooping tips is from 15 to 18 feet, and for ornamental purposes the palms should be planted from 35 to 40 feet apart in avenues or open spaces. It is one of the quickest growing palms and will attain a height of about 25 to 30 feet within four or five years. This is one of the most suitable palms for avenue planting and, like the coconut palm, is very long-lived under suitable soil conditions.

An objection to this palm is the litter arising from rotting male inflorescences and falling fruit. This can, however, be controlled to a large extent by cutting out both the male and female inflorescences as they develop.

(10) *Livistona chinensis* (Palmae), Chinese Livistona.

This very fine palm is a native of China and Japan and attains a height of 40 to 50 feet. It has a fine crown of fan-shaped leaves which spread about 6 to 8 feet from the trunk. The palms should be planted at a distance of 20 to 25 feet apart under good soil conditions. It is very suitable for avenues as well as for ornamental planting in open spaces.

(11) *Roystonea oleracea* (Palmae), Cabbage Palm.

The cabbage palm is a very tall-growing palm, indigenous to tropical America, and reaches a height of 70 to 80 feet. The spread of the leaves from the trunk varies from 12 to 15 feet so that the planting distance of these palms should be from 30 to 35 feet apart. This palm is most effective for avenue planting and compares very favourably with the closely related *R. regia* (Oreodoxa), the leaves of which are more drooping and feathery in their habit. The trunk is smooth and thickened at the base, the remainder being more or less cylindrical, whereas the stem of the royal palm is swollen upwards giving it a barrel-shaped appearance. The leaves, which are about 15 feet long, are spreading and only slightly drooping at the tips.

(12) *Roystonea regia* (Palmae), Royal Palm. (Plate VI).

This most elegant palm is a native of Cuba, Panama and other parts of tropical America and on account of its peculiar barrel-shaped stem it is also known as the "bottle palm." This palm, which has a straight, clean trunk, attains a height of 50 to 60 feet. Under suitable soil conditions the feathery drooping leaves of these palms have a spread of 10 to 12 feet from the trunk and the best distance for planting is from 25 to 30 feet. For avenue planting the palms should not be spaced less than 25 feet apart as a fair open space between the palms helps to show off their beauty. Consequently, when the soil conditions are good the spacing should be 30 feet apart to produce the best effect. This stately palm is undoubtedly one of the most effective trees for both ornamental and avenue planting and is well and truly named the royal palm. It was formerly known botanically as *Oreodoxa regia*.

Recommendations for Ornamental Palms.

Several of the palms mentioned form effective avenues of light shade and are very ornamental in appearance. The Royal Palm, *Roystonea regia*, is perhaps the best and should be more extensively planted. Where space is more restricted, *Cocos plumosa* may be selected and forms a uniform avenue of pleasing appearance. Since it is not possible to prune or otherwise control the growth of palms as in the case of dicotyledonous trees, special care must be exercised in selection of site. Most species of palms do not form much litter and are not particular as to their soil requirements. They often will thrive in sandy soil where trees would be a failure.

Method of Planting.

Considerable care and attention is necessary in the planting of roadside trees and, as far as possible, the following recommendations should be observed.

Propagation.—To raise young trees a nursery or propagating ground is necessary and it is important that the site selected should be in a well-sheltered position. The beds should be arranged in rows about 4 feet wide and consist of a good loamy soil, containing a fair proportion of sand.

The majority of the trees can be propagated from seed, but if this is not available either cuttings or layering may have to be adopted. Trees in the nursery should stand fairly close together if required for roadside planting as this ensures straight and clean trunks and a well-developed crown. The quick-growing trees may be ready to transplant at the end of a year, while slow-growing varieties and palms may take from $1\frac{1}{2}$ to 2 years before they are ready to be transferred to their permanent quarters.

Distance of Planting.—An approximate indication of the ultimate planting distance has been given when describing individual trees and palms.

If, however, the plan is to develop a quick shade a fast growing medium-sized tree, such as *Peltophorum*, could be chosen, the individual trees being planted at half the ultimate distance, say 30 to 35 feet, and alternate trees removed later. When quick shade is not required it would be more economical to plant 60 to 70 feet apart at the outset.

When complete shade is required the planting distance should be so gauged that the branches of any tree will touch those of the adjoining neighbour, so as to form a continuous canopy along the roadside. In the case of ornamental palms, however, a much better appearance will be obtained if space is left between the palms forming the rows. For example, if the crown of any particular palm has an overall spread of say 15 to 20 feet, the distance of planting such palms should be from 25 to 30 feet, thus giving a space of about 10 feet between the crowns of the palms.

Holing.—The holes for the trees should be about 3 feet in diameter and preferably not less than 3 feet deep.

The earth which is removed should be set aside and mixed with cattle manure if available or alternatively with about 8 ozs. of a slow-acting manure, such as steamed bone-meal or other organic fertilizer.

The soil at the bottom of the hole should be thoroughly broken up, after which the treated earth is replaced.

In cases where the soil is very poor it should be replaced partly or wholly with good surface soil from elsewhere.

The holes should be filled to slightly above ground level and allowed to stand for at least seven days until the mounded soil sinks and becomes more compact.

Planting.—Planting should be commenced at the beginning of a wet season, say in October or November and March or April. When space is available the trees should not be planted less than 12 to 15 feet from the side of the road, due allowance being made for any possible future widening of the road. Care should be taken to see that the seedling trees are not planted too deep and the soil should be worked well amongst the roots. Further, it is important that the soil should be well trodden round the roots to make the tree firm, otherwise it will dry out and may die. The young trees should be watered immediately after planting.

A useful method of protecting the trees from a setback when they are planted out on country roads where supervision cannot be continuous is to grow the seedling originally in a small basket, then to replant the small basket in a larger basket filled

with suitable earth and then to plant the larger basket in the actual roadside hole. This generally allows the tree to establish itself vigorously before it has to contend with the normal hardships of a tree planted in poor soil on a roadside.

As a general rule it is never advisable to plant more than two different varieties of trees in any particular road and when two varieties are alternated with one another it is important to see that they are more or less of the same habit of growth, both as regards height and form.

In planting narrow roads with trees which have a flat spreading crown, such as the rain tree, the trees on one side should be planted midway between those on the other side of the road in order to allow ample room for expansion and to produce a better shade.

In the case of palms which have a similar habit of growth the interplanting of different varieties often produces a considerable improvement.

Watering.—If the weather is dry after planting, the plants should be regularly watered until they are well established. In carrying out this operation a thorough soaking of the soil around the plants is essential.

Shading.—To protect the young trees from the hot sun some form of temporary shade should be provided for a week or two after planting them in the open. Fern fronds and palm leaves will be found most suitable for this purpose as they furnish the requisite amount of shade, which should not be too dense.

Maintenance of Trees and Palms.

Once the plants are established there remains the question of upkeep; the proper maintenance of the young trees is of equal, if not of greater, importance than the operation of planting. Due attention should therefore be given to the following problems as they arise.

Staking.—When the trees attain a height of 3 to 4 feet they should be securely staked to keep them perpendicular. At first the stakes should be about $4\frac{1}{2}$ to 5 feet long so as to allow of at least 2 feet being driven into the ground, but as the trees get larger, stakes about 8 feet long will be required; this applies more particularly to the quick-growing varieties, which are apt to become somewhat leggy in the early stages of their development.

The young trees should be secured to the stakes with strong tarred twine or rope, which should be loosely tied to allow of expansion of the trunk. On no account should wire be used for tying the young trees to the stakes.

Tree Guards.—The newly-planted trees will require to be protected by guards of wood or iron. Circular iron guards are made in two sections which are bolted together, and these cost about \$10 each. A good cheap guard, however, can be made by placing three posts in triangular fashion round the tree and nailing them together by two or three rows of rails, or alternatively using four posts to form guards about three feet square. These guards, made of 2 inch square timber, should be at

least 4 feet from the ground and covered on the sides with $1\frac{1}{2}$ inch mesh wire netting to afford further protection from animals. Such guards, made of soft timber covered with a coat of solignum or other wood preservative, would not cost more than \$2 each.

Cultivation.—A space of 2 to 3 feet round the base of the trees should be kept surface tilled and free from grass and weeds. This area should occasionally be mulched with well-decayed manure or litter, when available.

Pruning.—Pruning should receive early attention and any long, straggling shoots should be cut back in order to produce a compact crown. If young shoots or suckers are thrown out from the base of the tree they should be removed as soon as they appear. In pruning large branches they should always be removed close to the main trunk and all cuts made clean and tarred to prevent decay. To prevent the bark being torn away in unsightly strips it is advisable first of all to make an incision of the bark on the underside of the branch and then to cut it off a little higher on the upperside.

The question of pruning generally requires very careful consideration and it is not uncommon to find trees mutilated as a result of this operation. The principal aim of pruning is to obtain a clean trunk and a well-balanced crown, which demands a certain amount of practical experience.

It is frequently desirable to prune the tops of the young trees after about one or two years' growth, as this tends to give the crowns a much better shape.

Pests and Diseases.—A careful watch should be kept for "white ant" attacks, which may prove troublesome and cause serious damage if neglected. Some form of disease occasionally attacks palms, particularly the royal palm, and this generally results in the death of the palm. In such cases the only alternative is to remove the diseased or dead palm and replant with fresh stock.

The trees should also be periodically examined for parasites, such as *Loranthus*, which, if not removed early, become highly injurious and will eventually sap the vitality of the tree.

Manuring.—Manure should be applied regularly to the trees until they are about five years old, special attention being given to those which are backward. A dressing of 6 to 8 baskets of well-decayed cattle manure per tree once or twice a year will usually be found sufficient and this should be dug into the soil round the base of the tree. When cattle manure is not available an application of $\frac{1}{2}$ to 1 lb. of steamed bone meal or some other slow-acting fertilizer may be used as an alternative, double the quantity being applied to any stunted trees.

General.

If the detailed operations are to be properly carried out any attempt at large scale road planting will prove an expensive operation. In the circumstances it is recommended that not more than three or four fairly long roads should be planted each year according to the funds available.

In conclusion it cannot be emphasised too strongly that it is insufficient to plant trees or palms at stated distances and leave them to take care of themselves. Both trees and palms need regular attention if full benefit is to be derived from having introduced them into the particular planning scheme. It is only in the way described in this article that the amenities of any scheme can be preserved indefinitely.

Acknowledgment.

The author wishes to acknowledge the assistance of Mr. H. D. Meads of this Department in supplying the photographs illustrating this article.

Received for publication, 15th May, 1939

List of Trees and Palms for Planting on Roadides and in Open Spaces.

Serial No.	Botanical Name	Common Name	Height feet	Spread feet	Distance of Planting feet
(a) SHADE TREES.					
1.	<i>Albizia falcata</i>	Batai	+ 100	50—60	100—120
2.	<i>Delonix regia</i>	Flame-tree	40—50	30—40	60—70
3.	<i>Enterolobium saman</i>	Rain Tree	+ 100	50—60	100—120
4.	<i>Mimusops elengi</i>	Bunga Tanjong	40—50	25—30	50—60
5.	<i>Muntingia calabura</i>	West Indian Cherry	25—30	15—20	30—40
6.	<i>Paritica javanica</i>	Kedawang	+ 80	30—40	60—80
7.	<i>Peltophorum pterocarpum</i>	Batai	40—50	25—30	50—60
8.	<i>Pongamia pinnata</i>	Indian Beech	50—60	25—30	50—60
9.	<i>Pterocarpus indicus</i>	Angsana	80—100	50—60	100—120
10.	<i>Tamarindus indica</i>	Tamarind	60—80	25—30	50—60
(b) AVENUE TREES.					
1.	<i>Cassia fistula</i>	Indian Laburnum	40—50	15—20	35—40
2.	<i>Dryobalanops aromatica</i>	Borneo Camphor	+ 80	15—20	30—40
3.	<i>Eugenia grandis</i>	Jambu Ayer Laut	70—80	15—20	35—40
4.	<i>Fragaria cochinchinensis</i>	Tembusu	+ 60	15—20	35—40
5.	<i>Grevillea robusta</i>	Silky Oak	50—60	15—20	35—40
6.	<i>Jacaranda mimosaefolia</i>	Jacaranda	50—60	15—20	35—40
7.	<i>Lagerstroemia speciosa</i>	Pride of India	50—60	20—25	45—50
8.	<i>Melaleuca leucadendron</i>	Cajeput	+ 50	15—20	35—40
9.	<i>Mesua ferrea</i>	Ironwood	+ 80	15—20	35—40
10.	<i>Spathodea campanulata</i>	Tulip Tree	70—80	15—20	35—40
(c) ORNAMENTAL PALMS.					
1.	<i>Areca catechu</i>	Arecanut Palm	60—70	4—6	12—15
2.	<i>Arenca pinnata</i>	Sugar Palm	50—60	15—18	35—40
3.	<i>Borassus flabellifera</i>	Palmvra Palm	50—60	6—8	20—25
4.	<i>Caryota urens</i>	Toddy or Wine Palm	40—50	12—15	30—35
5.	<i>Cocos nucifera</i>	Coconut Palm	70—80	12—15	30—35
6.	<i>Cocos plumosa</i>	Feathery Coconut Palm	30—40	6—8	20—25
7.	<i>Corypha umbraculifera</i>	Tailpot or Fan-Palm	50—60	20—25	45—50
8.	<i>Cyrtostachys lakka</i>	Sealing-wax Palm	30—40	6—8	20—25
9.	<i>Elais guineensis</i>	Oil Palm	60—70	15—18	35—40
10.	<i>Livistona chinensis</i>	Chinese Livistona	40—50	6—8	20—25
11.	<i>Roystonea oleracea</i>	Cabbage Palm	70—80	12—15	30—35
12.	<i>Roystonea regia</i>	Royal Palm	50—60	10—12	25—30

TEA REGULATION IN MALAYA

BY

V. DAWSON,

Acting Agricultural Economist.

The development of the Malayan tea industry up to the end of 1938 was described in a previous number of this Journal.* It may be summarized very briefly as follows.

Under the first International Tea Agreement, which terminated on 31st March 1938, Malaya undertook that the area planted between the end of 1936 (when Malaya entered the Agreement) and the date of its termination should not exceed 3,000 acres, and that the total area planted in Malaya by the end of the first Agreement should not exceed 6,000 acres. Owing to a number of reasons, the total area planted by the end of the first Agreement was only 4,716 acres.

When the terms of a second Agreement to run for five years from 1st April 1938 came to be considered a considerable divergence of opinion was found between the various parties concerned. The International Tea Committee, after first proposing that there should be no increase at all beyond the 6,000 acres permitted by the first Agreement, eventually suggested that an extra 1,000 acres might be planted, bringing the Malayan total by the end of the second Agreement to 7,000 acres. The United Planting Association of Malaya suggested a total of 15,000 acres of additional planting by the end of March 1943. To reconcile these divergent viewpoints, the Government requested the United Planting Association of Malaya to form a Tea Planters' Section or Committee, a course on which agreement was reached, and the Committee appointed Sir John Hay as its London representative for the purpose of negotiating with the International Tea Committee.

It was anticipated that these negotiations might prove to be somewhat lengthy, hence the Tea Controller, in order that planting should not be held up while they were proceeding, continued to sanction suitable applications to plant during the period 31st March to the end of 1938. Because of the unfavourable planting weather experienced during the latter part of 1938, licences to plant during this period were extended, first until the end of March, 1939, and later to the end of June, 1939.

After negotiations with the International Tea Committee Sir John Hay forwarded for the consideration of the Malayan Governments and of the Tea Committee of the United Planting Association of Malaya a memorandum which contained, *inter alia*, certain proposals under which Malaya would agree to limit planting during the currency of the second Agreement, which terminates on 31st March 1943, so that the total area to be planted might be expected to produce the equivalent of Malaya's probable future tea consumption. It was estimated that an additional 10,000 acres would be sufficient to ensure this object. With these proposals the

* The Malayan Tea Industry in 1938. D. H. Grist, *Malayan Agricultural Journal*, Vol. XXVII, No. 4, April 1939.

Malayan Governments and the United Planting Association of Malaya agreed, whereupon the International Tea Committee undertook, in April, 1939, to recommend acceptance of these proposals to the Governments of India, Ceylon and Netherlands East Indies, the three principal participants in tea regulation.

In anticipation that such acceptance would be forthcoming and in view of the fact that any further delay would have prejudiced 1939 planting it was decided to anticipate the consent of the participating Governments and a comprehensive communiqué setting forth the proposed terms of the new Agreement was issued to the Malayan press at the end of May, 1939. Shortly afterwards Sir John Hay was advised by the International Tea Committee that the consent of the participating Governments had been obtained, and the Tea Controller, S.S. and F.M.S., was thus authorized to make allocations and to issue licences for the first year's planting, on the 10,000 acre total basis previously mentioned.

The official form of application for licence to plant tea had in the meantime been under consideration by the Malayan Governments and on 5th July, 1939, a second communiqué was issued to the press notifying that applications for licences to plant tea during the period 1939 to March 1943 would be received by the Tea Controller from 6th July to 6th September, 1939, and that applications for such licences must be made on forms obtainable from the Tea Controller.

The amended application form (Schedule C) was gazetted in a Supplementary Gazette (F.M.S.) on the 6th July, 1939. A copy of this, and of a note which accompanies it to applicants, is shown below:—

Schedule C.

The Tea Control Enactment, 1936.

APPLICATION FORM FOR LICENCE TO PLANT TEA.

Sir,

I/We beg to apply for a licence to plant.....acres with tea on my/our property, particulars of which are given below:

Name of owner.....

Description of Land.

State.....

Mukim.....

Particulars of title.....

Name of estate.....

Acreage now planted with tea.....

Particulars of nurseries existing, if any, including approximate number of seedlings therein.....

Proposed source of supply of planting material.....

Planting programme :

1939	...	acres
1940	...	"
1941	...	"
1942 and Jan/April 1943	...	"

Capital expenditure anticipated in

1939	...	\$
1940	...	\$
1941	...	\$
1942 and Jan/April 1943	...	\$

I undertake, if required, to furnish proof that I am in a position to provide or obtain capital as indicated above.

Signature of owner.....

Date.....

To

The Tea Controller,
Agricultural Department,
Kuala Lumpur.

Notice to Applicants.

The attention of applicants for licences is directed to the fact that they must in any application made by them under the Tea Control Rules, 1937 (as amended by Gazette Notification No. 3075A of 6th July, 1939, substituting a new form in Schedule C of those Rules) apply for allotment of the aggregate acreage which they intend to plant during the present Tea Regulation period, ending March 31st, 1943; and further that they must in such application set out their annual programmes for that period.

2. If, when allotment is made, the area allotted is less than that which was applied for, applicants will be given the opportunity of readjusting their annual programmes.

3. A licence will then be issued to cover planting in 1939 and 1940; and the balance of allotment will be reserved for the applicant, to whom there will in due course be issued licences to cover 1941 and 1942-1943 (to end March 31st).

4. This reservation and the issue of licences subsequent to the first will, however, be conditional on fulfilment of programme.

5. In the event of non-fulfilment of programme or of the commission of any offence against section 7 of the Tea Control Enactment 1936 the Controller may, at his discretion, withdraw such reservation and issue no further licence.

TEA CONTROLLER,
S.S. & F.M.S.

NOTES ON AN ATTEMPT TO ESTIMATE THRESHING QUALITIES IN PADI

BY

H.H. TUNKU YACOB BIN SULTAN ABDUL HAMID,

Principal Agricultural Officer, Kedah.

and

J. A. BAKER,

Agricultural Officer.

Padi cultivators in Kedah often refer to certain varieties of padi (*e.g.* Mayang Tekai and Reyong) as 'liat,' which means that they are difficult to thresh by beating in a tub. Cultivators who harvest their crop with the *ketam*,* and subsequently separate the grain by treading, do not look on this as an undesirable feature, but those who use the tub and screen (*i.e.* by far the majority of padi growers) dislike 'liat' varieties since they render threshing a much longer and more laborious operation. There is, of course, a happy mean as regards this character, and varieties which shatter too easily are equally undesirable since much grain may be wasted during handling.

With a view to comparing the behaviour of different varieties of padi in respect of this character a simple mechanical device was erected at the Telok Chengai Padi Experiment Station, Kedah. Its construction, which is intended to reproduce as far as possible the actual operation of tub-threshing, will be most easily understood from the accompanying photographs. A sheaf of padi, standardized as to weight and length, is fixed into a wooden frame which can be raised and lowered on a horizontal axle. The frame, together with the sheaf, is first raised to the vertical position and then allowed to fall under its own weight. The head of the sheaf strikes an inclined board (such as that used in ordinary threshing) and a certain amount of grain becomes detached. After a given number of strokes the sheaf is weighed again and the amount of grain lost is recorded. The total weight of grain is then calculated by threshing out the remainder and adding its weight to that of the grain previously lost. Thus we can say that, with a certain variety, X per cent. of grain is lost after a given number of strokes; and that, with another variety, Y per cent. is lost after the same number of strokes.

The dimensions of the machine at Telok Chengai are:

Inside breadth of outer framework	...	2 ft. 5 ins.
Height of axle above ground level	...	4 ft. 4 ins.
Internal width of frame holding sheaf	...	11 ins.
Length of frame holding sheaf (tip to axle)	...	2 ft. 8 ins.

Sheafs 3 ft. long and weighing 8 lbs. were used, this being roughly the size of an ordinary sheaf in Kedah.

* A small knife with which the crop is cut ear by ear.

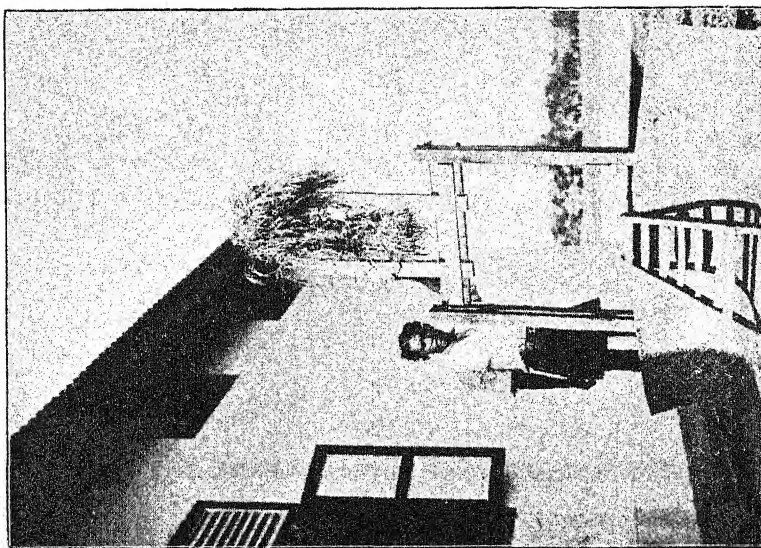
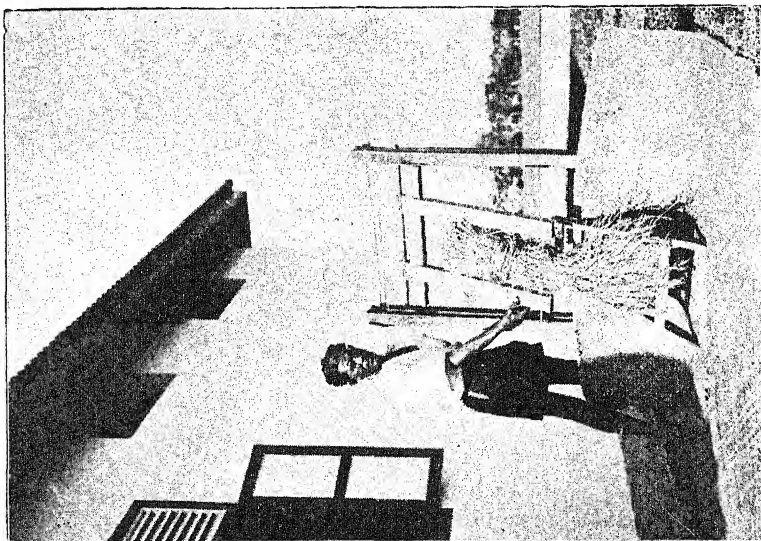
The number of strokes which should be given to obtain the most reliable results is a matter requiring investigation, and one which will depend, moreover, on the purpose of the experiment. Thus if we are estimating probable loss by shattering during handling, a small number of strokes would seem to be best. If, on the other hand, the point at issue is the labour involved in threshing different varieties, natural conditions will be more nearly reproduced by giving sufficient strokes to detach most of the grain. In the trials at Telok Chengai 21 strokes were given in each case, and it was found that this treatment detached 32 to 71 per cent. of the grain. As far as possible ripe but not over-ripe padi was used.

The results from seven varieties of padi were as follows:—

Variety.	Percentage	Total Grain Lost.
Mayang Ebus 80	...	71.2
Radin China 17	...	66.0
Siam 29	...	65.9
Mayang Ebus 88	...	65.8
Nachin 10	...	62.9
Rayong 6	...	49.4
Mayang Tekai	...	32.3

It is very difficult to get all factors standardized properly for a determination of this kind, and it is realized that there are many possible criticisms of the method used. Further trials will be necessary before it will be possible to specify threshing characters with confidence, but it is worth recording that the relative position of the varieties as indicated by the figures given in the above table coincides in general with the opinion of cultivators regarding their degree of frangibility.

Received for publication 4th May, 1939.



The Experimental Threshing Machine.

AN OUT-OF-SEASON TRIAL WITH PADI IN CONNEXION WITH THE PERAK RIVER PUMPING SCHEME AT BOTA AND LAMBOR KANAN.

Compiled by J. L. GREIG,
State Agricultural Officer, Selangor.

Introductory.

The *mukims*† of Bota, Laiang-Laiang and Lambor, downstream from the village of Parit on the banks of the Perak River are, for a rural area in British Malaya, densely populated. Although there is in these *mukims* an aggregate of approximately 2,500 acres of padi land, some of it, in a season of sufficient and well distributed rainfall, capable of yielding 400 *gantangs** (2,250 pounds) of padi per acre or even much more in the more fertile parts, the whole area used to be dependent for its water supply on direct rainfall.

The banks of the river are too high to allow of the construction of any simple gravitational irrigation scheme from the river itself, and no streams that can be utilized flow through the area. Hence in a year of capricious rainfall, after much heavy manual labour, padi cultivators were liable to suffer a failure of the crop with its attendant distress, owing to the lack of any form of irrigation.

Observations over some fifteen years have shown that in the majority of seasons droughts and floods have prevented anything but the production of a small crop and it has been the exception when rainfall has been sufficiently well distributed to enable this area to yield the harvest of which its soil makes it capable.

There is a belief amongst many Malays that these lands at one time gave quite good crops of padi in most seasons. It is quite reasonable to suppose that this is true and that the low and uncertain crops of more recent times have been the result of altered conditions, such as change in the levels of the Perak River and its banks.

As long ago as 1912 a scheme was drawn up by the Public Works Department, Perak, whereby it was proposed to pump water from the river. There were also proposals for an alternative scheme providing for a catchment area with a service reservoir to regulate the flow of water. In 1932 the problem was again taken up by the newly created Drainage and Irrigation Department, Straits Settlements and Malay States. On investigation the storage scheme had to be rejected for technical reasons, and as the only other source of supply for these *mukims* was the river, and as the right bank at the particular point where it was desirable to initiate the irrigation supply was about 10 feet high, the original suggestion of pumping was adopted.

† *Mukim* m. = a parish.

* *Gantang* m. = Imperial gallon.

Normally there is only one annual padi season which in this part of the country is from July to January, though it may extend to March in seasons of late rainfall. The young padi plants are transplanted in September, or later if weather is not propitious, and from then until the end of the year occurs the long wet season which may be expected to furnish suitable growing conditions. The aim is to harvest in the dry weather of February and early March, though, in fact, in the areas with which this article is concerned, it was often much later.

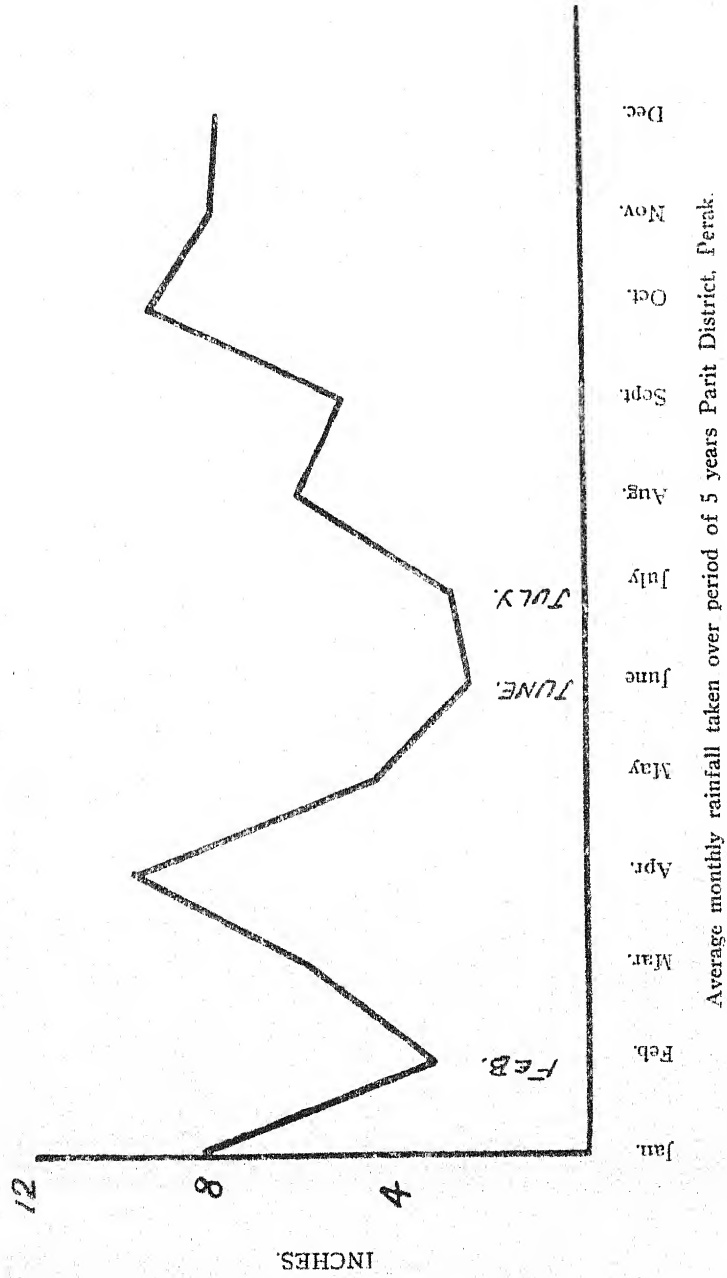
In order to solve the problem of supplementing the deficiencies of the rainfall as economically as possible the Drainage and Irrigation Department drew attention to the annual average precipitation graph (Figure I) and suggested taking advantage of the two peaks of rainfall in April and again in November. It was pointed out that a crop grown in an October-May season would get approximately the same amount of rainfall as a crop grown in the normal July-February season.

It was proposed to irrigate the padi lands in Bota and Lambor Kanan *mukims*. The suggestion was to divide this area in half and retain the normal season for the northern half and make the season in the remaining half October to May. This would mean that the maximum water requirements of the two component parts on account of low rainfall would be at different periods. In the northern half the padi would require irrigation water in the comparatively dry July-September period whilst the corresponding period in the southern half would be January-March. The main advantage of this system of partially alternate irrigation from the engineering point of view lies in the fact that a pumping installation of approximately half the capacity and consequently of considerably less capital cost would be able to render the same service as one twice the size supplying the whole area for the normal padi season from July to February.

With this object in view an installation consisting of a Gill Axial flow pump capable of delivering 25 cubic feet of water per second driven by a 68 h.p. Allen Diesel engine was completed early in 1935. The main irrigation channel $11\frac{1}{4}$ miles long and a branch channel $2\frac{3}{4}$ miles long were dug and the supply of water commenced on the 25th June, 1935.

The view of the Department of Agriculture was that, although the normal season padi would be sufficiently tall and strong to withstand serious damage by flooding, which is always liable to occur in the riverine *mukims* in October, November and December, the padi grown in the October-May season would be at such a young stage of growth that it would be much more susceptible to damage by floods. As an alternative it was suggested that a January-July season would hold out more chances of success. Reference to the graph in Figure I shows that there would be two danger periods in such a season. The first would be the short dry season extending from mid-January to mid-March when the area to be planted would have to rely almost entirely on water supplied by the pump to maintain nurseries and facilitate cultivation. The second would be liability to flooding during the short wet season in April, when in some years floods had occurred. Apart from these

Figure 1.



considerations, the possibility was suggested that the mere supply of moisture by irrigation might not be enough and that for padi to grow well and produce a good crop the atmospheric humidity normal to rainy weather might be necessary.

The proposals for alternate irrigation were considered at a meeting of the Perak Drainage and Irrigation Board held in Taiping on 3rd April 1935. It was agreed that it would be unreasonable to go counter to the prejudices of the local cultivators who had always cultivated padi in a July-March season, and force half of them to cultivate in a January-July season to suit the conveniences of the pumping scheme until the chances of securing a crop at all or a yield equally as good as a normal season crop were known. Even a partially successful crop in the unusual season would create the unsatisfactory position that the cultivators in one half of the area would have to resign themselves to smaller crops if alternate cultivation were enforced. In such an event it would seem more equitable to allow padi over the whole area to be grown in the July-March season, utilizing the available water as far as possible. It was further pointed out at the meeting that observations had indicated that padi planted out of the normal season might have a very much longer maturation period than that usual for the variety when planted in the normal season.

In view of these considerations it was agreed that, as the scheme had been visualized and designed from the start as one of alternate irrigation, the January-July season should be given a trial on an area of about 20 acres, before making any attempt to induce cultivators to adopt this season. Accordingly an area of this size was selected in the *bendang*† Pendi at about half a mile from the pumping station. The *Penghulus*¶ of Laiang-Laiang and Bota were approached and, exercising their good offices, persuaded the owners of the area required to allow their land to be taken over by the Department of Agriculture for the purposes of the experiment as soon as their own crops had been harvested.

Details of Experiments.

Season 1936. It was hoped to lay down nurseries towards the end of December 1935, anticipating that the normal season harvest would be completed and the area available to commence cultivation for the out-of-season crop during January. Unfortunately the standing crop had been planted late, harvesting was correspondingly delayed and it was not possible to lay down dry nurseries of padi Radin 11 and Radin 13 until the 11th March. *Menajak*§ was begun on contract on 20th March and occupied approximately three weeks. Transplanting was started on 19th April, when the padi had been in the nursery for 39 days, and was completed by the 5th May.

† *Bendang* m. = a padi field.

¶ *Penghulu* m. = a head man of a mukim.

§ *Menajak* m. = the operation of cutting out-of-season growth in preparing padi fields.

For the first month the general appearance of the padi was satisfactory and growth was normal, but on 6th June larvae of the padi stem borer *Diatraea polychrysa* Meyr. were found to be damaging the stem tissues. A count was made and it was estimated that 8 per cent. of tillers of the Radin 11 and 3 per cent. of the Radin 13 were affected.

During July when normal season cultivators commenced to clear and cultivate neighbouring padi fields there was a large influx of rats into the experimental area which was now about 4 months old from sowing.

The use of poison bait and traps had little effect and to obtain an idea of the yield which might be expected four wire netting cages 11 ft. square were constructed over selected areas. These cages were erected during the first week of September.

By the beginning of October the padi was about 5 months old from planting and there was still practically no sign of flowering, although the normal maturation period of the varieties used is 6 to 6½ months from sowing.

At this stage it was decided to abandon the experiment for the year with the exception of that part of the crop growing in cages. Sufficient labourers were retained to trap rats and keep the cages clear of weeds.

At the end of December only a few heads of grain were harvested from the cages.

Tiller counts were made on three complete plants from the wire netting cages with the results shown below in Table I.

Table I.
Details of Tiller Counts for Padi Plants in 1936

Cage No.	Variety of Padi.	No. of Tillers	No. of Flowering Tillers	No. of Tillers Setting Grain.
1	Radin 11 ...	15	7	2
		22	16	3
		21	7	1
2	Radin 11 ...	25	18	1
		26	5	0
		26	14	4
3	Radin 13 ...	19	9	2
		23	9	6
		19	13	3
4	Radin 13 ...	23	10	3
		31	8	5
		25	9	4
Means	Radin 11 ...	22.5	11.2	1.8
	Radin 13 ...	23.5	9.7	3.8

The number of flowering tillers taken during a similar count with the same strains at the Padi Test Station, Bruas, situated about 10 miles away, gave the following figures:—

Variety.	Mean No. of Flowering Tillers.			
Radin 11	8.8
Radin 13	8.6

These figures are in the same order as those examined in the experiment, but whereas in the latter only a small proportion produced grain, practically all flowering spikes at Bruas Station produced grain.

Season 1937. Of the 20 acres cultivated the previous season, 5 acres lying at the north end of the block were discarded owing to irrigation difficulties.

Nurseries were sown on 11th January 1937 with the following strains of padi:— Siam 29, Radin Siak 34, Radin 11, Radin 13, Reyong 20, and Nachin 756.

All these strains have a normal maturation period of 6 to 6½ months, sowing to harvest.

Transplanting was commenced on 1st February and was completed on the 15th.

In order to ensure that the area would be adequately cared for, a resident labour force of twelve Indian labourers was established. Weeding was carried out regularly and careful measures taken by means of traps and poison baits to keep down rats.

As soon as the padi started to grow it was attacked by stem-borers. The extent and seriousness of the damage is apparent on examining Table II below. As a result the padi could make little progress, the production of new tillers counterbalancing the destruction of old ones.

By the third week of June, eighteen weeks after transplanting, only a very small proportion of plants had flowered and in most cases the grain was empty, the grain bug *Leptocorisa acuta* Thubg. being present in quantity. It was now becoming increasingly apparent that either insect damages or seasonal influence or a combination of both had retarded the growth of the padi to such an extent that little further useful data would be obtained by repeating the experiment in the following year.

At a meeting of the Perak Drainage and Irrigation Board held at Taiping on 21st September 1937 the State Agricultural Officer informed the Board of the unsatisfactory nature of the results. The padi eventually came into ear and a very small harvest was obtained during March 1938 concurrently with the harvest for padi planted in normal season. The padi in this experiment had been 14 months in reaching maturity as compared with 6 to 6½ months normal for the varieties when grown in the usual padi season. All varieties were similarly affected and the average yield was approximately 1,000 lbs. per acre.

Conclusions.

This experiment establishes the fact that, in so far as a number of popular Malayan varieties are concerned, there are serious and probably insurmountable difficulties in the way of successful substitution of a January-July season for the

Table II.
Details of Tiller Counts on Padi Plants in 1937.

(Plants were taken at random from an area of about 20 sq. ft.)

Variety of Padi.	Percentage of Plants Attacked	Average No. of Tillers per plant	Average No. of Bored Tillers per plant	Average No. of Surviving Tillers per plant	Percentage of Bored Tillers
Counts made 25th—30th March 1937.					
Siam 29	100	13.1	6.7	6.4	51.1
Radin 11	96	10.4	3.9	6.5	37.5
Radin 13	98	8.2	3.6	4.6	43.8
Radin Siak 34	10	18.3	0.2	18.1	1.2
Reyong 20	88	8.9	3.1	5.8	34.6
Nachin 756	22	9.9	0.4	9.5	4.0
Mean	69	11.6	3.0	8.6	25.6

Counts made 25th—30th April.

Siam 29	78	9.1	4.3	4.8	47.5
Radin 11	71	7.0	2.6	4.4	36.6
Radin 13	85	9.0	4.3	4.7	47.8
Radin Siak 34	48	21.3	1.8	19.5	8.4
Reyong 20	68	8.7	2.2	6.5	25.4
Nachin 756	65	13.2	2.7	10.5	20.7
Mean	69.1	11.4	3.0	8.4	26.2

Counts made 25th—30th May.

Siam 29	61	25.3	3.3	22.0	13.1
Radin 11	58	15.7	2.3	13.4	14.7
Radin 13	47	13.0	1.7	11.3	12.9
Radin Siak 34	66	28.4	2.6	25.8	9.1
Reyong 20	73	19.4	3.8	15.6	19.4
Nachin 756	94	20.9	4.0	16.9	19.0
Mean	66.5	20.4	2.9	17.5	14.7

Table III.
Rainfall Records for Period 1934 to 1938 at Parit, Perak,
Federated Malay States.

Month.	1934	1935	1936	1937	1938	Monthly Mean
	ins.	ins.	ins.	ins.	ins.	ins.
January ...	10.00	6.23	12.50	7.34	5.63	8.34
February ...	6.21	2.49	1.07	3.69	3.57	3.41
March ...	7.75	5.65	6.45	5.19	5.84	6.18
April ...	7.77	3.92	6.70	21.26	9.97	9.92
May ...	7.62	3.67	4.06	3.66	3.78	4.56
June ...	5.23	2.37	1.46	.54	2.81	2.48
July ...	2.06	3.38	2.28	3.05	3.30	2.81
August ...	7.67	10.00	4.09	4.78	4.98	6.30
September ...	4.91	2.35	7.77	6.10	5.10	5.23
October ...	8.04	10.09	8.49	11.59	8.79	9.40
November ...	12.32	6.34	10.31	7.71	3.80	8.10
December ...	4.76	9.46	13.81	4.34	6.70	7.81

July-March season normal for padi cultivation in the area concerned. As is indicated in the introductory remarks, general observations elsewhere in Malaya had indicated that this might prove to be the case.

The experiment does not provide any data on which to base any definite conclusions as to whether the reasons for the fact established are direct seasonal influence on the growth of the padi plants: whether the seasonal influence is more directly connected with pest incidence: or whether a combination of both is the cause of the much prolonged maturation period exhibited by the varieties grown in the experiment.

Experiments conducted by the Entomological Division of the Department and concerned with investigations of padi stem borer incidence, however, give strong indication that the heavy stem borer attack recorded for the experiment described in this article may have been the main, if not the sole, cause for the prolonged maturation period and consequent delayed fruiting of the varieties of padi used in this experiment.

Summary.

For two seasons an attempt was made to grow padi out of season (*i.e.* January-July), deficiencies in the rainfall being made up by the pumping station at Pendiati, Bota. In neither season was a satisfactory crop harvested.

Heavy damage was done by padi stem-borers (*Diatraea polychrysa* Meyr.), padi bug (*Scotinophara* sp.) and the grain bug (*Leptocorisa acuta* Thubg.), and in the first season by rats.

In the second attempt the padi, although sown during January 1937, did not ripen and come to maturity until March 1938, the general ripening time for normal season crop in the district, a period of 14 months from the date of sowing.

Whether this was caused by direct seasonal influences on plant growth, by seasonal influences on pest incidence, or by a combination of both, is outside the scope of this experiment. Other experiments concerned with investigations into stem borer incidence, however, provide strong indications that seasonal pest incidence may be the main, if not the sole, cause.

The information in this article has been compiled mainly from reports by officers of the Drainage and Irrigation Department and of the Department of Agriculture in Perak, Federated Malay States.

QUARTERLY REPORT ON THE MALAYAN PINEAPPLE CANNING INDUSTRY.

March to May, 1939.

*Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S.,
from Reports of Field Officers.*

Factories.

The total number of registered factories is fifteen, as compared with sixteen for the previous quarter. Nine factories started operating during the early part of the main pineapple season which began in April; five of these were in Johore, three in Singapore, and one in Selangor. The other six registered factories were not working as a result of the quota restriction scheme operated by the Central Board. If all the sixteen factories worked to pack their allotted quota, which in every case is below their maximum output, the cost of production would be increased, owing to the resulting higher overhead costs. In practice, the canners have agreed to buy and sell their quotas among themselves in such a way that the factories required are kept operating at full capacity, thus reducing overhead and consequently production costs. The idle factories are being maintained ready for immediate use in case any of the working factories should for any reason have to cease production.

Production and Sales.

The production quota fixed by the Central Board for the short season ending March 31st, 1939, was 850,000 cases. Owing to a briskening demand, the Central Board had to revise this quota to allow an actual production of 1,030,726 cases.

The quota for the main season extending from April 1st to September 31st, 1939, was fixed in advance at 1,000,185 cases. April reports indicated that a large proportion of the main season's pack was being sold in advance, and that the demand for the Golden Grade (or first quality) pack was particularly keen, all stocks of this grade having been sold out.

Total exports of canned pineapples from this country for the four months ending April 30th, 1939, amounted to 28,263 tons, valued at \$3,131,646. The January and February exports were given in the last report, while those for March and April amounted to 7,616 and 9,277 tons respectively.

Prices and Stocks.

The Central Board made an increase in price of 15 cents per case on all grades of pineapples, the price per case thus being increased from \$3.10 to \$3.25 for 1½ lbs. Standard Cubes, and from \$3.50 to \$3.65 in the case of the Golden Grade for the same type of pack.

Quotations in Singapore in Straits dollars per case of 48 cans of 1½ lbs. each during the three months under review, were as follows:—

1939	General Average Quality (G.A.Q.)			Golden		
	Sliced Flat	Sliced Tall	Cubes	Sliced Flat	Sliced Tall	Cubes
March ...	3.05	3.20	3.10	3.45	3.60	3.50
April ...	3.05	3.20	3.10	3.45	3.60	3.50
May ...	3.20	3.35	3.25	3.60	3.75	3.65

Fresh fruit prices paid to growers tended to rise slightly during the above period. Prices per 100 of fresh fruit ranged from 90 cents to \$1.70 in Singapore, from 50 cents to \$2.20 in South Johore, and from 50 to 80 cents in Selangor, depending on quality. Selangor prices appear to be too low and an investigation into the functioning of the regulations governing the Central Board, which are in part framed to regulate growers' prices in direct ratio to the prices obtained per case of G.A.Q. cubes, has been instituted by the Department of Agriculture.

Stocks of canned fruit on hand in Singapore at the end of May were estimated at 472,000 cases.

Government Research Station and Canning Factory.

A small demonstration canning factory, situated at Johore Bahru and equipped by Government with the latest types of canning machinery, started operating during the quarter. It is under the control of the Canning Officer, Department of Agriculture, S.S. & F.M.S., who reports that demonstration runs were carried out for the benefit of packers, and that considerable interest was taken in the new types of machines not previously seen in this country. Numerous enquiries were received from packers who are interested in installing similar equipment in their own factories.

General.

Singapore has enjoyed a very good fruit season during the period under review, high-quality supplies being plentiful.

The Central Board of Pineapple Packers, Malaya, was gazetted on May 12th, 1939, in the Straits Settlements, as being the officially-recognized packers' association. The Board has continued to function smoothly.

No new planting has been reported during the quarter. Reports from Selangor indicate that in one district small-holders are cutting out the pines from certain areas in which they had been interplanted among coconuts, due chiefly to the approaching maturity of the main crop and to the diminished size of fruit being obtained from the old pineapple intercrop.

Abstract.

RICE RESEARCH.*

This progress report of 22 pages deals with quality in milled rice and the effect thereon of polishing, parboiling, storage and manuring, and contains a miscellany of interesting observations.

Dr. Sreenivasan points out that comparison of specimens of raw and parboiled rices milled to different degrees shows that, with a limited amount of milling, parboiled rice does not lose as much nitrogen or phosphorus as raw rice. With increased milling, however, the difference tends steadily to diminish, until beyond the half-milled condition more nitrogen and phosphorus are removed with the polishings of parboiled than of raw rice, so that in a fully polished condition there is little difference in composition between the two types.

The reason for this difference in the rate of removal of nitrogen and phosphorus is, apparently, that the process of parboiling causes an inward diffusion of these constituents so that the higher concentrations which occur in the outer layers of the bran of raw rice, are found further inwards in the bran layers after parboiling. There is also diffusion of nitrogen and phosphorus from the bran layers into the starchy endosperm.

The results of analyses of commercial samples of rice show, however, that parboiled rice is somewhat richer in proteins and minerals than ordinary white rice. The reasons given for this are that since parboiling produces a coloured product even after polishing, and as the parboiled grain begins to break up if polishing is extended beyond a certain stage, it is not generally polished to the same extent as raw rice.

In addition to the above reasons there is the fact that usually the coarser and coloured varieties of rice are used for parboiling. These have thick bran layers and contain more nitrogen and phosphorus than the so-called "superior" varieties.

It is concluded, therefore, that the generally higher nutritive value of parboiled rice is due to its being usually consumed in an undermilled state, and to the fact that less of the nutritive constituents are lost by the ordinary process of washing and cooking.

The fat and proteins of rice bran have a definite, though small, inhibiting action on the activity of digestive ferments.

It is stated that whole grains of cooked parboiled rice digest more slowly than those of cooked raw rice and require better mastication; but parboiling results in partial dextrinization of the rice starch so that under ordinary conditions, where proper penetration of the enzymes is ensured, such rice is more easily digested than raw rice.

* Abstract of a bulletin entitled "Progress Report on the Scheme of Research on Quality in Crops with Special Reference to Rice, during the period December 1934 to November 1937," by A. Sreenivasan, M.A., D.Sc., Department of Biochemistry, Indian Institute of Science, Bangalore.

Unpolished rice is slow to cook, but this and its digestibility and food value vary with the variety. Polished rice is more easily digested than unpolished rice, but the digestibility of half-polished rice may be better than that of highly polished rice. Much work, however, is still necessary to obtain a correct indication of the digestibility of unmilled or undermilled rice.

Samples of three different varieties of rice were stored as padi, and results showed that the cooking quality of the rice improved under good conditions of storage. Well-stored rice grains swell on cooking to about four times the original volume and the cooked grains remain detached from one another; while rice from freshly harvested padi scarcely swells to twice its original volume and cooks to a pasty condition which prevents digestive ferments from coming into further contact with the mass. Trials have shown that well-swollen and detached grains are easily penetrated by the digestive enzymes.

Hulled, unpolished rice cannot be kept for more than a month and deteriorates rapidly during storage, owing to the decomposition of the oil or fat in the pericarp or bran layers in contact with the moist atmosphere. The factors contributing to improved keeping quality in unpolished rice are being studied. Desiccation with air-tight storage has been successful.

The chemical composition of rice is greatly influenced by several factors such as type of soil, climatic conditions, seasonal variation and by manurial treatments. There is considerable variation in composition of different varieties.

The colour of parboiled rice may be improved considerably by reducing the time of steeping and parboiling. The use of certain chemicals in the steep water also lightens the colour of the grain. Recently, a process has been patented by which a light-coloured product can be obtained by heating the steeped grain for very short periods at over 400°C.

R. B. J.

Review.

Plant Injection for Diagnostic and Curative Purposes.

By W. A. Roach, (Foreword by Prof. V. H. Blackman Sc.D., F.R.S.). *Technical Communication 10 of the Imperial Bureau of Horticulture and Plantation Crops, East Malling, Kent, England, 1938, pp. 78, plates 2, text figures 41, bibl. 162, price 5 shillings.*

Man has toyed for centuries with the idea of feeding his fruit trees direct instead of by more orthodox but slower methods and in the heyday of the Italian Renaissance we find Leonardo da Vinci noting that if it is desired to produce poisoned fruit the injection of fruit trees offers a way.

More recently various "tree doctors" have suggested that easy rejuvenation of orchards can be effected by the use of their own particular injection methods, but such methods have always been somewhat suspect, since obviously different conditions demand different remedies and the cure may prove worse than the disease.

It has remained for Dr. Roach to bring order out of chaos and show those of us who are attracted by the idea how to set about our investigations.

He starts by giving a history of injection work in Europe and the U.S.A., paying particular attention to that published in recent years on the detection and cure of deficiency diseases. He notes also the successful use of injection for purely physiological purposes, as, for instance, of glucose into vines, just before bud break to ensure a good fruit set. He points out, moreover, how injection methods may be of great value in the study, not only of mineral deficiencies, but also of rootstock influence and of the effect of the chemical constituents of a fruit on its storage capacity.

Recent cases of successful injection cited include the following:—diagnosis of incipient chlorosis of the iron shortage type at East Malling; diagnosis and cure of a copper deficiency dieback disease in apples in Western Australia; determination of the cause and cure of boron deficiency diseases of apples in Canada and New Zealand; increase in vigour and freedom from insect pests in apple trees injected with solutions of various chemical solutions in England.

His own experiments have been in progress for seven years on material which has ranged from the strawberry plant to fully grown apple and plum trees, and most of the present paper is devoted to a consideration of the methods used. It is for this clear and illustrated account that horticulturists will be particularly grateful. He describes in detail, with the help of text figures and lists of tools, the technique used for the injection of particular parts of standing trees and other plants, varying in size from a single interveinal area of a leaf to whole main branches, noting, moreover, the type of problem for which each particular method is best suited. He shows how, in the most delicate methods, the injection of leaves and their comparison with neighbouring untreated leaves or parts of leaves enables a rapid diagnosis to be

made of the mineral deficiency from which a plant or tree is suffering. He describes how whole trees may be injected for experimental purposes or even for economic reasons in the commercial orchard.

In short he shows how the operations advocated may be carried out and how to avoid those many pitfalls which await the over-zealous, although he is far from suggesting that all his methods are perfect.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

June, 1939.

The Weather.

Over most of the Peninsula weather during June was normal for the time of year: hot and dry, with a low rainfall. In Penang conditions continued to be abnormal. In May there was very heavy rain and floods; in June the total rainfall was again above average.

In north Pahang precipitation was well above average, frequent heavy showers occurred and the weather was cool and similar to that experienced in a normal wet season month.

Crop Reports.

Rubber.—Prices generally remained unchanged, though local conditions caused prices to harden slightly in some districts; thus in Ulu Langat, Selangor, many tappers have been engaged in rice cultivation, and the resulting reduction in production of rubber caused prices in that District to increase.

In the Selangor coastal districts there has been an increase in tapping anticipating the approach of the coupon issue for the third quarter.

The price difference between smoked and unsmoked rubber is now so small that cabinets are generally not used.

In Kelantan conditions in this respect are more satisfactory. There the price difference between smoked and unsmoked sheet (F.A.Q.) is from \$2 to \$3 per picul. In the Kota Bharu District twelve of these smoke houses are at present in existence, four are under construction and sixteen await construction, while in the Kampong Machang district the numbers are 14, 5 and 4 respectively. Capacities range from 4 to 60 piculs. Many of these smoke houses now in operation, under construction or mooted, are on co-operative lines.

Padi.—In Kedah, cultivation has commenced under favourable conditions. Likewise in Perak, Penang and Province Wellesley water supplies are ample and cultivation is in full swing. In the Sungei Acheh area, Province Wellesley, there has been some difficulty in getting cultivators to start work on the dates fixed, though conditions were ideal.

Lack of rain in Malacca has held up cultivation, and water supplies were so short in some areas that by the end of the month it had not been possible to make a start.

The prohibition of export of padi and rice from Kedah has been followed by a fall in price in that State. Several rice mills have temporarily suspended production.

In Krian the price of padi in the field has dropped slightly. The Government Rice Mills have stopped buying. There is in any case little padi left in the hands of dealers or cultivators.

Up to the 16th June the Government Rice Mills had bought 283,000 piculs of padi (approximately 46 per cent. of the total crop), and 35,000 piculs (6 per cent.) had passed through the Customs gates into Province Wellesley.

The sealing of Seraup 48 has now finished. Approximately 195,000 bags of S.48 (69 per cent.) of the Krian padi bought by the mills and 31 per cent. of the total crop) obtained the bonus. As the mills wished to buy as much padi as possible considerable latitude had to be allowed in the quality of the padi that received the bonus but all was of good grain type containing a high proportion of Seraup not differing in its milling qualities from a pure sample of S.48.

During the last nine months 21 applications to erect small rice mills in Krian have been received; ten of these mills have been put up and are now working and several more are under construction.

Livestock.

It will be remembered that during 1938 in Kelantan large numbers of cattle were wiped out by an outbreak of disease. The Kelantan Government is now arranging to restock the worst affected areas. A sum of \$9,000 has been voted and loans will be made to those who lost their animals in this epidemic to enable them to buy sufficient animals to carry out this season's ploughing. Applications have been received from nearly 200 cultivators. Upwards of 700 acres of padi land are affected.

Penang "Hill Lands".

The new Agricultural Assistant, Hill Lands, started work at the beginning of June. During the rains of the last two months erosion has taken place on tapioca, yam and ginger holdings. Four hill guards have been appointed by the Land Office, whose duty it is to report any new land which they find being opened up.

Tours of the Rural Lecture Caravan.

The Caravan toured Penang and Province Wellesley from June 7th to 26th. Quite good attendances were reported at most centres. The subject of soil erosion was given special prominence. A visit to Ayer Itam was particularly successful: a crowd of 3,000 to 4,000 Chinese, mostly concerned in hill land cultivation listened intently to a lecture by the Chinese Agricultural Assistant on soil erosion on Penang Hill.

Agricultural Instruction.

During June two instructional courses were held for Kedah school boys of Standard VI and VII: the former attended a course on padi planting held at Telok Chengai Experiment Station, which lasted for 7 days; the latter, a course on general agriculture at Gajah Mati Agricultural Station, which lasted for 15 days.

Sixteen boys attended the first course and 11 boys attended the second. They were accommodated at the respective Stations for the duration of the courses. In each case one lecture was given by the Principal Agricultural Officer and the remainder by the Assistant Agricultural Officer-in-charge. The course at Telok Chengai included lectures and practical instruction in cultivation, preparation of nurseries, sowing and water control; that at Gajah Mati included lectures on cover crops, green manure, maize cultivation and gambier. In the latter course the boys were able to harvest sweet potatoes and gourds which they had planted during an earlier visit, and were also able to see the results of their efforts at budding.

DEPARTMENTAL NOTES.

Leave.

Mr. J. N. Milsum, State Agricultural Officer, Perak, returned from leave on the 8th June. Mr. J. W. Jolly, Acting State Agricultural Officer, Perak, has assumed duty in the post of State Agricultural Officer, Negri Sembilan.

Mr. V. Dawson, Vice-Principal, School of Agriculture, Malaya, returned from leave on the 8th June and assumed acting duty in the post of Agricultural Economist. Mr. H. L. Barnett, Acting Agricultural Economist, has resumed duty in his substantive post of Assistant to the Agricultural Economist.

Mr. J. Cook, Agricultural Officer, returned from leave on 29th June, and has been posted to the Central Experiment Station, Serdang.

Mr. R. P. Davidson, State Agricultural Officer, Negri Sembilan, has been granted 248 days leave from 30th June 1939 to 3rd March 1940 inclusive.

FERTILIZER PRICES, JULY, 1939.

The following are the prices current for the month of July, 1939, of some of the more important fertilizers.

Product.	Analysis				Price per ton \$	
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)		
		Soluble	Insoluble			
Sulphate of Ammonia	...	20.6	—	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	—	80.00
Muriate of Potash	...	—	—	—	50	112.00
Sulphate of Potash	...	—	—	—	48	112.00
Superphosphate (concentrated)	...	—	39	—	—	105.00
Superphosphate	...	—	16-18	—	—	60.00
Basic Slag	...	—	—	16	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical. MARKET PRICES.

June 1939.

Major Crops.

Rubber.—Prices were maintained at a higher level during June but weakened slightly in the second half of the month. No. 1. X. Ribbed Smoked Sheet, loose, opened in Singapore at 28½ cents per lb., improved to 29 cents on the 10th June, and closed at 28 cents. The average of daily quotations for the month was 28.53 cents per lb., as compared with 27.88 cents in May. The London average price was 8.24 pence and New York 16.31 cents gold, as compared with 8 pence and 15.95 cents gold in May.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, June, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak			Kuala Pilah, Negri Sembilan					Batu Pahat, Johore.			
	7	14	28	1	8	15	22	29	7	14	21	28
Smoked Sheet ...	36.00	35.50	35.13	36.10	35.50	35.00	34.80	35.00	—	34.90	34.10	—
Unsmoked Sheet ...	—	—	33.00	—	—	—	—	—	34.42	33.70	34.25	33.97
Scrap ...	No purchases											

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$3.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 21st June.

Palm Oil.—Prices were maintained at a slightly higher level during June, but weakened at the close. Table II gives the month's quotations. The averages of the May quotations were:—palm oil £13.2.6, kernels £8.18.2.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
June 2	£ 13. 10. 0 Canada	£ 9. 0. 0 Hamburg
" 9	13. 10. 0 "	9. 0. 0 Rotterdam
" 16	13. 10. 0 (nominal)	9. 0. 0 Hamburg
" 30	13. 0. 0 "	8. 7. 6
Average	£ 13. 7. 6	£ 8. 16. 11

Copra.—The Singapore market fluctuated somewhat during June. The sun-dried grade opened at \$3.85 per picul and improved to \$3.90 on the 7th June; it then fell to \$3.60 on the 17th, and closed at \$3.75. The Singapore average price for the month was \$3.74 per picul, and \$3.41 for the mixed grade. The May averages were \$3.75 and \$3.45 respectively.

Copra cake remained unchanged at \$1.60 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in May were as follows:—Siam No. 2 Ordinary \$3.81, Rangoon No. 1 \$3.47, Saigon No. 1 \$3.22, as compared with \$3.71, \$3.17 and \$3.42 in April, and with \$4.16, \$3.90 and \$3.92 in May 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were: Singapore 27, Penang 32, Malacca 28, as compared with 26, 32 and 28 respectively in April.

The average declared trade value of imports during May was \$3.76 per picul, as compared with \$3.72 in April and \$3.76 in March.

Padi.—Prices of padi per 100 gantangs (gallons) ranged from \$8 to \$12 in most parts of the country. In Mersing, Johore, the price range was \$9 to \$10, but in other parts of the State was \$12 to \$14. In Kedah the range was \$7.50 to \$7.70.

The Government Rice Mills, Perak, paid \$2.20, rising to \$2.30 per picul for padi, and the Temerloh Rice Mill, Pahang, paid \$2.20.

Pineapples.—Prices remained unchanged at the new levels fixed by the Central Board of Packers in May. Prices, per case of 48 cans of 1½ lbs. each, were:—G.A.Q.: Sliced Flat \$3.20, Sliced Tall \$3.35, Cubes \$3.25; Golden: \$3.60, \$3.75 and \$3.65 respectively.

Fresh fruit prices per 100 were as follows:—Singapore 50 cents to \$1.80; Selangor 50 to 80 cents; Johore, 1st quality \$1 to \$1.30, 2nd quality 85 cents to \$1, 3rd quality 55 to 80 cents.

Beverages.

Tea.—Two consignments of Malayan highland tea, comprising 148 packages, were sold on the London market during June at 1s.3½d. and 1s.3¾d. per lb., the average price being 1s.3½d. Seven consignments of lowland tea, comprising 426 packages were sold in London at prices ranging from 11¼d. to 1s.1½d. per lb., the average price being 1s.0.29d.

The average London prices per lb. realized for tea from other countries, according to the *Tea Market Reports* for June of the Tea Brokers' Association of London, were as follows:—Ceylon 1s.3.05d., Java 1s.0.67d., Indian Northern 1s.1.99d., Indian Southern 1s.2.23d., Sumatra 11.08d.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 27th June, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 76, Medium Grown Teas 69, Low Grown Teas 66.

Coffee.—Liberian coffee improved from \$14.50 to \$14.75 per picul. Excelsa was quoted at \$10.50 throughout the month, weakening to \$10.25 at the close. Robusta was unchanged throughout the month at \$6.75 per picul.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$11.22 to \$13.30 per picul, and for Sourabaya coffee \$9.43 to \$11.27, the price within these ranges depending upon quality.

Spices.

Arecanuts.—Prices fluctuated considerably during June. The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$5.94, Medium \$5.51, Mixed \$5.04.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.48 to \$6.67; Red Whole \$5.10 to \$6.75; Sliced \$8.76 to \$11.93, as compared with \$4.50 to \$6.65; \$5.19 to \$6.69; and \$7.62 to \$9.62 in May.

Pepper.—Prices fell during June, and the monthly averages per picul were:—Singapore Black \$7.44, Singapore White \$11.62, Muntok White \$11.88. The May average prices were \$8, \$12.44 and \$12.69 respectively.

Nutmegs.—There was no change in this market; 110's and 80's were both quoted at \$28 per picul. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Prices remained unchanged. Siouw \$85 per picul (nominal), Amboina \$58. Locally produced mace, dry, was sold in Penang at \$70 per picul.

Cloves.—Nominal quotations in Singapore remained unchanged at \$40 per picul for both Zanzibar and Amboina. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* for 26th June, 1939, from Rs. 1.15 to Rs. 1.27 per lb.

Miscellaneous.

Derris.—There was no change in Singapore prices of derris during June. Roots sold on a basis of ether extract were \$7.50 to \$9 per picul, and roots sold on rotenone content were \$17.50 to \$18.50.

Gambier.—Prices remained unchanged: Block \$8 per picul nominal, and No. 1 Cube \$17.

Sago.—Prices fell during June. Pearl averaged \$4.10 per picul, and Flour, Sarawak Fair, averaged \$2.42, as compared with \$4.28 and \$2.54 respectively in May.

Tapioca.—With the exception of Pearl Medium, prices fell during June. Flake Fair averaged \$4.10 per picul; Seed Pearl averaged \$4.85, and Medium Pearl was quoted throughout the month at \$5. The May average prices were \$4.18, \$4.81 and \$4.94 respectively.

Tobacco.—Kelantan prices for prepared tobacco were high during June: 1st quality \$100 to \$160, 2nd quality \$75 to \$128, 3rd quality \$45 to \$112 per picul. In Malacca prices ranged from \$16 to \$20, and in Johore from \$10 to \$65. The general range elsewhere was: 1st quality \$16 to \$28, 2nd quality \$10 to \$20, 3rd quality \$5 to \$13. In Kedah the range was \$40, \$25 and \$17.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

May, 1939.

Malaya.—Imports of foreign rice during May were 82,318 tons,† and exports 13,263 tons. Net imports were accordingly 69,055 tons, as compared with 46,425 tons in 1938.*

Of the May imports 43 per cent. were consigned to Singapore, 17 per cent. to Penang, 8 per cent. to Malacca, 25 per cent. to the Federated Malay States, and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 53,025 (64.4), Burma 25,019 (30.4), French Indo-China 3,106 (3.8), other countries 1,168 (1.4).

Of the exports during May 73 per cent. were consigned to the Netherlands Indies and 27 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 10,696 (80.6), Burma 1,790 (13.5), French Indo-China 657 (5.0), parboiled 40 (0.3), Malayan production 80 (0.6).

May net imports by countries of origin were (in tons, percentages in brackets):—Siam 42,329 (61.3), Burma 23,229 (33.6), French Indo-China 2,449 (3.6), elsewhere 1,048 (1.5).

India.—Foreign exports during January to April were 110,000 tons, as compared with 98,000 in 1938, an increase of 12.2 per cent. Of these exports 3.6 (4.1) per cent. were to the United Kingdom, 1.8 (8.1) per cent. to the Continent of Europe, 30.0 (33.7) per cent. to Ceylon, 3.7 (5.1) per cent. to the Straits Settlements and the Far East, and 60.9 (49.0) per cent. to other countries. The percentages in brackets are for the corresponding period in 1938.

Burma.—Foreign exports from the 1st January to 24th May totalled 2,015,545 tons, as compared with 1,689,252 in 1938, an increase of 19.3 per cent. Of these exports 57.4 (41.7) per cent. were to India, 6.1 (9.3) per cent. to the United Kingdom, 8.5 (7.7) per cent. to the Continent of Europe, 8.4 (10.4) per cent. to Ceylon, 8.4 (14.0) per cent. to the Straits Settlements and the Far East, and 11.2 (16.9) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average May prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 229, Small Mills Specials 234.

Siam.—Exports of rice and rice products from Bangkok during January to April were 540,333 tons, as compared with 565,521 tons in 1938.

Japan.—The supply and demand of rice for the period 1st May to 30th October, 1939, are estimated as follows:—

* Abridged from the Rice Summary for May 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.).

† It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

Supply:—

	tons
Stocks on 1st May	5,103,000
Estimated imports from foreign countries ...	15,000
Estimated imports from Korea	491,000
Estimated imports from Formosa	435,000
Total ...	6,044,000

Demand:—

Estimated consumption	4,818,000
Estimated exports	42,000
Total ...	4,860,000
Surplus	1,184,000

French Indo-China.—Entries of padi into Cholon during 1st January to 31st May totalled 1,005,090 tons, as compared with 615,712 tons in 1938, an increase of 63.2 per cent. Exports of rice during the same period were 927,520 tons, as compared with 581,970 tons in 1938, an increase of 59.4 per cent.

Prices of rice in Saigon rose during April from \$2.77 to \$2.93 per picul. Padi prices improved from \$1.78 to \$1.89 per picul.

The Netherlands Indies.—The latest information available was published in the March Summary.

Ceylon.—Imports during January to May totalled 253,234 tons, as compared with 237,229 tons in 1938, an increase of 6.7 per cent. Of these imports 15.0 (16.3) per cent. were from British India, 64.3 (72.1) per cent. from Burma, 0.4 (0.4) per cent. from the Straits Settlements, and 20.3 (11.2) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 12th May totalled 678,871 tons, as compared with 458,625 tons in 1938, an increase of 48 per cent. Of these shipments 42.9 (61.3) per cent. were from Burma, 45.3 (24.9) per cent. from Saigon, 10.8 (11.1) per cent. from Siam, and 1.0 (2.7) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments for the Levant from 1st January to 12th May totalled 11,728 tons, as compared with 15,762 tons in 1938, a decrease of 25.6 per cent. Shipments for Cuba, West Indies and America from 1st January to 11th May were 87,097 tons, as compared with 81,703 tons in 1938, an increase of 6.6 per cent.

MALAYAN AGRICULTURAL EXPORTS, APRIL, 1939.

PRODUCT.	Net Exports in Tons				
	Year 1938	Jan./April 1938	Jan./April 1939	April 1938	April 1939
Arecanuts ...	33,769	13,977	14,382	2,646	3,794
Coconuts fresh†‡ ...	116,743†	30,183†	34,454†	7,438†	9,592†
Coconut oil‡ ...	49,140	14,515	17,520	3,010	4,527
Copra‡ ...	68,754	12,442	6,748	2,302	3,041
Copra cake ...	7,112	2,038	2,377	435	523
Gambier, all kinds ...	1,632	509	583	84	122
Palm kernels ...	9,359	2,785	3,369	609	545
Palm oil ...	54,377	16,515	15,980	3,565	3,902
Pineapples, canned ...	73,168	26,908	28,263	6,697	9,277
Rubber¶ ...	360,898¶	135,968¶	106,457¶	27,603¶	27,695¶
Sago,—flour ...	4,537	2,132	2,622	388*	306
„ —pearl ...	4,203	1,375	1,183	413	387
„ —raw ...	5,088*	2,332*	1,493*	622*	605*
Tapioca,—flake ...	981	320	335	74	83
„ —flour ...	3,072*	1,262*	1,087*	404*	233*
„ —pearl ...	17,818	5,232	5,185	1,162	1,601
Derris (tuba root) ...	676	131	431	51	73
‡Copra equivalent ...	150,944	36,632	35,908	7,342	10,589

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5*	2,082.2	4,242.7*	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
Total ...	11,275.5	10,586.7	21,862.2	2,067.0	1,798.1	3,865.1
Total January to May, 1938 ...	10,097.1	7,212.7	17,309.8	1,829.3	1,313.0	3,142.3
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,153.9	3,620.0	8,778.9

* Revised figure.

Stocks on estates as at 31st May, 1939, were: palm oil 5,230 tons. palm kernels 712 tons.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping (a)				Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acreage (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	43,127	1,411	3.3	15,846	36.7	523	1.2	17,257	40.0	25,870	60.0	7,413	17.2
Malacca ...	120,256	5,036	4.7	38,116	31.7	2,159	1.8	43,752	36.4	76,504	63.6	24,249	20.2
Penang ...	2,479	nil	nil	1,204	48.6	9	0.4	1,204	48.6	1,275	51.4	60	2.4
Singapore ...	32,007	5,867	18.4	9,770	30.5	175	0.5	15,637	48.9	16,370	51.1	3,464	10.8
Total S.S. ...	197,869	12,914	6.5	64,936	32.8	2,866	1.4	77,850	39.3	120,019	60.7	35,186	17.8
F. M. S.—													
Perak ...	285,391	10,931	3.8	78,390	27.5	8,112	2.8	89,321	31.3	196,070	68.7	48,437	17.0
Selangor ...	317,904	11,876	3.7	74,851	23.6	7,457	2.3	86,727	27.3	231,177	72.7	54,097	17.0
Negri Sembilan ...	264,228	13,025	4.9	78,082	29.6	14,970	5.7	91,107	34.5	173,121	65.5	45,002	17.0
Pahang ...	85,677	4,619	5.4	29,224	34.1	5,784	6.8	33,843	39.5	51,834	60.5	9,509	11.1
Total F.M.S. ...	953,200	40,451	4.3	260,547	27.3	36,323	3.8	300,998	31.6	652,202	68.4	157,045	16.5
U. M. S.—													
Johore ...	481,367	23,748	4.9	143,137	29.8	37,810	7.9	166,885	34.7	314,482	65.3	71,772	14.9
Kedah ...	197,833	9,639	4.9	34,493	17.4	7,062	3.6	44,132	22.3	153,701	77.7	43,922	22.2
Kelantan ...	31,205	403	1.3	7,396	23.7	2,415	7.7	7,799	25.0	23,406	75.0	5,561	17.8
Trengganu (d) ...	4,817	nil	nil	49	1.0	nil	nil	49	1.0	4,768	99.0	1,651	34.3
Pertis (e) ...	1,459	458	31.4	239	16.4	155	10.6	697	47.8	762	52.2	294	20.2
Brunei ...	5,913	nil	nil	2,098	35.5	313	5.3	2,098	35.5	3,815	64.5	1,378	23.3
Total U.M.S. ...	722,594	34,248	4.8	187,412	25.9	47,755	6.6	221,660	30.7	500,934	69.3	124,578	17.2
Total MALAYA ...	1,873,663	87,613	4.7	512,895	27.3	86,944	4.6	600,508	32.0	1,273,155	68.0	316,809	16.9

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 31st March, 1939.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports			Exports including re-exports				Stocks at end of month			Consumption 3		
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to May 1939	during the month	Jan. to May 1939	during the month		January to May 1939		Ports	Dealers	Estates of 100 acres and over						
								Foreign	Local	Foreign	Local									
MALAY STATES:—	2	8	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Federated Malay States	...	5,309	25,261	9,487	46,545	2,643	19,385	Nil	Nil	Nil	Nil	10,280	3,017	55,581	12,514	...	4,200	25,187	16	79
Ipohore	...	2,367	9,696	4,184	20,936	2,341	12,992	Nil	65	Nil	202	2,476	4,883	12,804	22,145	...	1,621	9,643	...	...
Kedah	...	2,299	5,408	2,242	11,381	379	3,423	Nil	Nil	Nil	Nil	1,418	1,528	6,985	8,976	...	169	5,408	...	...
Perlis	...	24	25	6	35	17	99	Nil	Nil	Nil	Nil	36	Nil	Nil	141	...	...	24	...	...
Kelantan	...	649	500	316	1,498	734	2,963	Nil	Nil	Nil	Nil	266	381	1,453	2,463	...	1,062	500	...	...
Trengganu	...	47	285	146	632	171	1,049	Nil	Nil	Nil	Nil	Nil	294	Nil	1,666	...	18	337	...	...
Brunei	...	15	64	41	164	42	282	...	...	...	...	...	81	...	465	...	...	8	73	...
Total Malay States	...	8,710	41,234	16,422	81,121	6,627	40,122	Nil	65	Nil	202	14,430	10,220	76,823	47,670	...	7,120	41,172	16	79
S. SETTLEMENTS:—	...	1,339	2,260	899	4,486	484	2,315	Nil	...	Nil	...	1,884	...	10,530	...	...	1,233	2,245	...	...
Malacca	...	486	888	348	1,632	134	702	Nil	...	Nil	...	4,435	...	28,113	...	...	516	853	...	...
Province Wellesley	...	1,496	1,942	13	74	60	288	1,840	9,968	72,127	47,562	...	...	...	...	...	1,866	2,302	13	...
Penang	...	3,338	15,669	105	489	14	203	1,0797	...	61,278	...	21,465	...	100,081	...	...	4,936	12,270	263	...
Singapore	...	18	Nil	Nil	Nil	13	46	60	...	261	...	Nil	...	Nil	...	...	...	...	...	...
Labuan
Total Straits Settlements	...	4,834	19,464	3,441	1,367	705	3,554	12,697	9,968	73,566	47,562	27,784	Nil	138,721	...	...	6,302	16,340	3,374	30
...	...	4,834	28,174	44,675	17,789	87,802	7,232	43,676	12,697	10,033	73,666	42,214	10,220	215,347	47,670	...	6,302	23,460	44,546	46

TABLE II
DEALERS' STOCKS, IN DRY TONS

Class of Rubber	Federated Malay States	Singapore	Penang	Province of Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	3,597	11,900	2,221	1,550	1,381	58
WET RUBBER	603	280	81	326	270	86
TOTAL	4,200	12,270	2,302	1,776	1,651	169

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula :
Exports + Stocks at end of month, \times Consumption, $i.e.$, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] + [21] + [22] + [23] + [24] + [25] + [26] + [27] + [28] + [29] + [30].
For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40% stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Columns (3) and (3A) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.

5. All statistics brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication of statistics is always the latest available.

6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 28rd June, 1929.

above, with
June, 1939

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to May 1939
Singapore	30.723	149.951
Penang	7.472	44.853
Port Swettenham.	4.019	20.233
Malacca	NH	510
MALAYA	42.214	215.547

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to May 1939
32	23	34
Malay States	24,572	124,258
Straits Settlements	2,161	10,239
26,673	26,673	134,498
MALAYA	..	..

METEOROLOGICAL SUMMARY. MALAYA, MAY, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.					
	Means of			Absolute Extremes			At 1 foot	At 4 feet	Total.	Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.			
	A. Max.	B. Min.	Mean of A and B.	Highest.	Lowest.	Min.					Lowest.	Max.	Highest.							
														°F				°F	°F	°F
		°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.	Precipitation .01 in or more.	Precipitation .04 in or more.	Thunder-storm.	Fog morning obs.	Gale force 8 or more.	hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor	91.0	73.1	82.1	94	71	83	76	84.6	85.3	7.17	182.1	1.89	13	11	3	4	3	209.50	6.76	55
Bukit Jeram, Selangor	89.5	73.3	81.4	93	71	84	76	85.7	87.5	7.95	201.9	2.42	10	10	—	—	3	245.30	7.91	64
Sitiawan, Perak	89.7	73.8	81.7	93	71	79	76	84.4	84.4	12.42	315.5	5.28	9	8	—	—	—	228.55	7.37	60
Ipoh Aerodrome, Perak	90.9	73.2	82.1	94	70	83	76	84.5	85.0	5.22	132.6	1.86	12	9	3	—	—	206.75	6.67	55
Temerloh, Pahang	90.5	73.3	81.9	94	71	84	77	86.2	86.8	6.29	159.8	1.65	14	12	4	6	1	197.25	6.36	52
Kuala Lipis, Pahang	90.0	71.7	80.9	94	69	84	74	84.3	85.0	7.26	184.4	3.02	12	11	5	28	1	180.80	5.83	47
Kuala Pahang, Pahang	87.3	74.2	80.7	89	72	82	77	85.2	86.8	10.74	272.8	2.72	18	12	—	—	—	215.15	6.94	56
Kallang Aerodrome, Spore	86.9	76.8	81.9	89	74	84	81	83.3	84.0	2.33	51.6	0.72	11	8	2	—	1	200.50	6.47	53
Bayan Lepas Aerodrome Penang	87.5	74.5	81.0	91	72	82	78	84.3	85.2	15.17	385.3	6.53	19	15	4	—	1	178.30	5.75	47
Malacca Town, Malacca	85.8	74.2	80.0	89	72	81	77	84.3	85.3	8.80	223.5	4.58	14	10	3	—	1	209.60	6.76	55
Kluang, Johore	89.1	72.0	80.5	92	70	85	74	82.6	83.1	12.04	305.8	3.03	11	9	7	7	—	193.60	6.25	51
Mersing, Johore	88.4	72.3	80.3	91	70	84	74	83.6	83.0	7.13	181.1	1.39	16	15	7	—	2	232.75	7.51	61
Alor Star, Kedah	87.3	74.4	80.9	91	73	82	77	85.6	86.1	11.53	292.9	3.25	21	20	3	—	1	206.45	6.66	54
Kota Bharu, Kelantan	89.7	74.0	81.9	92	71	87	77	85.1	84.9	9.43	239.5	2.22	16	13	4	—	2	217.90	7.03	57
Kuala Trengganu, Trengganu	89.0	73.2	81.1	92	68	85	75	84.4	85.9	7.26	184.4	1.72	10	10	9	2	2	217.75	7.02	57
Labuan	87.0	76.9	81.9	90	73	83	80	84.9	86.8	11.22	285.0	2.58	19	19	3	—	1	218.80	7.06	57
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	74.3	63.5	68.9	78	60	68	65	72.1	72.5	7.02	178.3	1.53	20	16	2	8	—	156.40	5.05	41
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.9	58.0	65.5	77	52	69	62	70.5	69.8	7.68	195.1	2.03	19	17	2	3	—	152.55	4.92	40
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	72.3	60.2	66.3	77	58	67	62	*	*	8.06	204.7	2.17	19	17	—	—	4	164.65	5.31	43

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE
Malayan Agricultural Journal.

AUGUST, 1939

EDITORIAL.

Derris. Writing editorially on this subject in August 1936 we pointed out that if derris is to be more widely used as an insecticide it is desirable that growers should be in a position to state the toxic content (rotenone and/or ether extract) of their root within reasonably narrow limits.

The lack of knowledge in this respect and the frequently occurring wide variability in the toxic content of derris from the same source of supply have been without a doubt two factors affecting adversely its use as an insecticide.

There is no need to stress the importance of exporting a standard product, while we would go further and say that if this standard product is of high quality the combination is sufficient advertisement for it in the world's markets.

This Department has for several years past been endeavouring to solve the double problem thus presented, and an article in this issue summarizes the early history of the investigational work undertaken and proceeds to a description of the latest findings. The prime necessity appeared and still appears to be that of developing types with a high and uniform toxic content, and the early investigations started with a study of the toxic content of individual plants of those types favoured by manufacturers.

The individual plants were lifted, the stems reserved for the purpose of striking cuttings and the roots analysed. An arbitrary limit of toxic content was adopted. Cuttings from those plants in which the roots had a toxic content lower than the limit were discarded. The superior cuttings were planted in rows, each row being confined to the vegetative progeny of one parent plant.

Ample space was allowed for the development of the individual plants, while two different types of soil were also selected. In this way it was hoped to develop highly toxic clonal plants of the two types chosen for the experiment.

The results were somewhat surprising, more particularly in respect of the unexpectedly wide variations in toxic content both between a parent plant and any member of the vegetative progeny and also between any two members of the vegetative progeny selected at random. It is interesting to note though that the average toxic content of the vegetative progeny is of the same order as that of the parent plant.

No explanation can at present be offered for the wide variations in toxic content referred to above. Further work is outlined which it is hoped will eventually lead to the isolation of a clonal type having the desirable combination of high toxic content with marked root development.

Although in this respect the results may have been somewhat disappointing there are valuable findings in other directions. In the first place the results show that the toxic content of the root is developed at a much earlier age than previously anticipated. For example, figures show that when the plants are only 18 months old the roots may have a toxic content of the same order as when the plants are almost twice this age. Secondly, it is now apparent that the yield of root per plant is influenced considerably by the spacing, since increase in yield resulted when the plants were spaced more widely apart than the conventional system of 3 ft. x 3 ft. square. It may well be too that toxic content at a particular age is also influenced by spacing.

The above points are of considerable interest to estates in arranging a planting programme, and further experiments are in hand to ascertain the optimum spacing for producing the maximum yield per acre.

In the meantime, estates need have no fear that if they use proved planting material it will deteriorate; the results show that in spite of the variations the average quality remains of the same order from generation to generation.

PRELIMINARY RESULTS OF ANALYSIS OF CLONAL TYPES OF DERRIS UNDER FIELD CONDITIONS

BY

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Introductory.

An account was published in a previous number of this Journal of selection experiments carried out with different species of Derris growing in the General Nursery at the Central Experiment Station, Serdang⁽¹⁾.

The same procedure was adopted in each case. The stems of the individual plants were removed and reserved for the purpose of striking cuttings, after which the complete root systems were lifted. The "fine" or marketable roots (roots of $\frac{1}{2}$ in. diameter or less) were separated and analysed. Determinations of rotenone and ether extract were made.

Cuttings of those plants of *Derris malaccensis* var. *sarawakensis* and *D. elliptica*, Sarawak creeping, having roots of superior toxic content were planted in rows in two different types of soil to ascertain the extent to which the vegetative progeny resembled the parent plant in respect of rotenone and ether extract.

The above two species of Derris were selected as being the most promising of the various types originally established at Serdang judged by yield of root and economic possibilities at the time of the original selection work.

Roots from *D. malaccensis* var. *sarawakensis*, which are characterized by a high ether extract combined with a low rotenone content, were then favoured by British insecticide manufacturers. *D. elliptica*, Sarawak creeping, root with its higher rotenone content, even though this is associated with a moderate ether extract, was more likely to be favoured in the United States of America, where root is judged primarily on its rotenone content.

Lay-Out of Experiment.

Two types of soil were chosen for the experiment. The first belongs to the Valley Quartzite type and may be described as consisting of a dark clay loam with 50 to 60 per cent. fine fractions; the second belongs to the Raub Series and is a yellow friable soil with a good crumb structure.

Deep cultivation was given in both cases before planting.

The rooted cuttings were set in rows 8 ft. apart with 5 ft. between the plants in the rows.

The individual plants were therefore given much more space for development than the parent plants, 40 sq. ft. per plant compared with about 9 sq. ft. for a parent plant.

Results of Analysis.

The results of analysis for the two species of *Derris* on the two types of soil will be considered separately under the following headings:—

- (a) Yields of root at different ages.
- (b) Variations in character of root from individual plants.
- (c) Variations in ether extract of root from plants of different ages.
- (d) Variations in rotenone content of root from plants of different ages.
- (e) Correlation between rotenone content and ether extract.

Derris malaccensis var. *sarawakensis*.

(a) *Yields of Root at Different Ages.*

Marked differences have been found between the weights of air-dry (moisture content 8 per cent.) marketable root from individual members of a vegetative progeny from a single parent plant set in a row. These differences apply equally to both types of soil.

Table I shows the results obtained with two series of plants harvested at the same age as the parent plants. Thus, in the case of the vegetative progeny of plant No. 5 on the Valley Quartzite soil, the weights vary from 26.53 to 8.85 ozs., with an average of 18.99 ozs., while for that of plant No. 29 on the Raub Series soil the weights vary from 19.22 to 5.47 ozs. with an average of 10.44 ozs.

Although there are wide differences between the weights of root from individual plants it is interesting to note that the average figure for both types of soil is of the same order.

Comparing the vegetative progeny with the respective parent plants in which the yields of root were of the same order the figures show that the average weight of root on both types of soil is much greater in the case of the vegetative progeny of plant No. 5 than for plant No. 29. The average weight of root for the progeny of No. 5 is 17.60 ozs. compared with 10.14 ozs. for No. 29. In the case of plant No. 5 this represents a three-fold increase compared with a two-fold increase for No. 29.

While it is reasonable to assume that this increase can be attributed largely to the wider spacing of the plants the results show that it is not proportionate to the increased area allotted per plant. Thus, assuming the parent plants and the vegetative progeny had 9 and 40 sq. ft. respectively for development, the average weights of root for the two progeny should have been of the order of $\frac{40}{9} \times 5.2$, say 23 ozs. In the case of plant No. 5 there is a deficiency of about 5 ozs. and for No. 29 one of over 13 ozs.

Reference to Table II shows, however, that the calculated increase in weight may be largely exceeded, notably in the case of plants Nos. 1 and 2. While in the case of plant No. 2 the increased age at which the vegetative progeny were harvested compared with that for the parent plant may be a contributing factor towards the higher yield of root, the vegetative progeny of plant No. 1 were harvested 7 months earlier than the parent plant.

Table I.

Comparative Yields of Air-Dry Marketable Root from Individual Plants of *Derris malaccensis* var. *sarawakensis*, 24 months old on Different Types of Soil at Serdang.

Parent Plant, No. 5		5.11 ozs.	
Serial No. of Vegetative Progeny		Nature of Soil	
		Valley Quartzite	Raub Series
		ozs.	ozs.
1	...	20.63	14.65
2	...	16.58	26.98
3	...	20.81	12.56
4	...	25.22	20.04
5	...	18.34	13.23
6	...	26.53	14.08
7	...	8.85	15.31
8	...	14.99	12.88
Maximum	...	26.53	26.98
Minimum	...	8.85	12.56
Average	...	18.99	16.22
Parent Plant, No. 29		5.30 ozs.	
1	...	34.74	13.19
2	...	11.89	10.33
3	...	5.82	8.01
4	...	9.52	6.95
5	...	3.88	19.22
6	...	2.82	5.47
7	...	3.70	12.84
8	...	6.35	7.48
Maximum	...	34.74	19.22
Minimum	...	2.82	5.47
Average	...	9.84	10.44

With regard to the effect of age on yield of root, the figures in Table III, which cover all the plants harvested at the different ages, indicate a gradual increase in yield for both types of soil up to an age of 24 months. After this there would appear to be little or no variation in yield of root.

(b) *Variations in Character of Root from Individual Plants.*

The character of the root varies with the individual plant. Thus, the root system of one plant in a row may contain a high proportion of roots varying in size from $\frac{1}{2}$ to $\frac{1}{4}$ in. in diameter, while the next plant in the same row, yielding approximately the same amount of root, may contain a similar high proportion of roots of a smaller size.

The results of two series of determinations are shown in Table IV.

The figures also show that a high proportion of the large-sized roots, $\frac{1}{2}$ to $\frac{1}{4}$ in. diameter, is not necessarily correlated with a marked root development. Thus, in the case of Nos. 4 and 5 of the vegetative progeny from parent plant No. 11 there is a difference of over 13 per cent. in the proportion of the large-sized roots, although the total yield of root in both cases is of the same order.

Table II.

Average Weights of Air-Dry Marketable Root from Individual Plants
of *Derris malaccensis* var. *sarawakensis* on Different Types
of Soil at Serdang.

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Nature of Soil		
				General Nursery	Valley Quartzite	Raub Series
			months	ozs.	ozs.	ozs.
1	Parent plant ... Vegetative progeny ...	1 8	24 17	1.24	8.65	6.88
2	Parent plant ... Vegetative progeny ...	1 6	24 35	1.94	25.74	14.41
5	Parent plant ... Vegetative progeny ...	1 8	24 24	5.11	18.99	16.22
7	Parent plant ... Vegetative progeny ...	1 4	24 17	2.86	7.25	5.88
8	Parent plant ... Vegetative progeny ...	1 4	24 17	8.47	6.62	9.50
9	Parent plant ... Vegetative progeny ... do. do. ... do. do. ...	1 2 2 6	24 13 16 35	3.32	2.20 3.40 6.24	3.05 5.50 11.69
11	Parent plant ... Vegetative progeny ... do. do. ...	1 3 4	24 13 15	4.52	2.00 2.90	3.40 7.17
22	Parent plant ... Vegetative progeny ... do. do. ...	1 3 4	24 13 15	6.59	2.60 4.27	5.73 8.65
29	Parent plant ... Vegetative progeny ...	1 8	24 24	5.30	9.84	10.44
34	Parent plant ... Vegetative progeny ...	1 2	24 13	4.44	1.25	3.40

Table III.

Yields of Air-Dry Marketable Root from Individual Plants of *Derris malaccensis* var. *sarawakensis* of Varying Ages on Different Types of Soil at Serdang.

Age of Plants	No. of Plants	Valley Quartzite			Raub Series		
		Maximum	Minimum	Average	Maximum	Minimum	Average
months		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
13	10	3.70	0.70	2.07	8.30	1.20	4.03
15	8	7.40	0.90	3.16	12.80	4.80	7.91
17	16	12.80	2.40	7.80	13.10	3.40	7.28
24	16	34.74	2.82	14.42	26.98	5.47	13.33
35	12	29.80	1.16	15.99	24.90	1.13	13.05

Table IV.

Proportions by Weight of Roots of Varying Sizes from Individual Plants of *Derris malaccensis* var. *sarawakensis* 15 months old on Raub Series Soil at Serdang.

Parent Plant No.	Serial No. of Vegetative Progeny	Weight of Air-dry Marketable Roots	Proportion of Roots		
			$\frac{1}{2}$ to $\frac{1}{4}$ in. diameter	$\frac{1}{4}$ to $\frac{1}{8}$ in. diameter	$\frac{1}{8}$ in. diameter and less
		ozs.	per cent.	per cent.	per cent.
11	4	9.00	21.7	46.4	31.9
	5	8.00	8.2	59.1	32.7
	6	6.20	17.2	47.9	34.9
Average		7.73	15.7	51.1	33.2
22	4	11.60	25.2	48.7	26.1
	5	12.80	29.0	38.5	32.5
	6	4.80	22.2	46.8	31.0
	7	5.70	24.8	43.3	31.9
Average		8.70	25.3	44.3	30.4

Table V.

Variations in Ether Extract of Marketable Root from Individual Plants of *Derris malaccensis* var. *sarawakensis* on Different Types of Soil at Serdang.

(Moisture-free basis)

Serial No. of Vegetative Progeny	Age of Plants	Nature of Soil	
		Valley Quartzite	Raub Series
	months	per cent.	per cent.
(a) Parent Plant, No. 11, 24 months old, 22.57 per cent.			
1	13	25.30	27.45
2		26.03	23.96
3		24.53	28.17
Average		25.29	26.53
4	15	25.48	25.48
5		26.91	26.41
6		25.15	25.30
7		26.28	28.12
Average		25.96	26.33
(b) Parent Plant, No. 1, 24 months old, 20.88 per cent.			
1	17	22.30	25.26
2		27.56	25.21
3		27.06	27.44
4		28.78	27.66
5		25.93	27.38
6		19.91	22.55
7		20.77	24.25
8		20.83	23.14
Maximum		28.78	27.66
Minimum		19.91	22.55
Average		24.14	25.36
(c) Parent Plant, No. 29, 24 months old, 23.09 per cent.			
1	24	32.76	32.89
2		25.54	25.79
3		28.19	26.37
4		23.93	28.25
5		23.80	23.60
6		25.07	23.61
7		21.95	30.23
8		26.87	26.27
Maximum		32.76	32.89
Minimum		21.95	23.60
Average		26.01	27.13
(d) Parent Plant, No. 9, 24 months old, 25.65 per cent.			
5	35	23.93	22.43
6		20.94	21.35
7		23.34	18.08
8		22.61	19.08
9		21.40	17.38
10		22.69	19.70
Average		22.48	19.67

Table VI.

Average Ether Extract of Marketable Root from Individual Plants of
Derris malaccensis var. *sarawakensis* on Different
 Types of Soil at Serdang.

(Moisture-free basis)

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Nature of Soil		
				General Nursery	Valley Quartzite	Raub Series
			months	per cent.	per cent.	per cent.
1	Parent plant ... Vegetative progeny ...	1 8	24 17	20.88	24.14	25.36
2	Parent plant ... Vegetative progeny ...	1 6	24 35	21.24	16.67	20.27
5	Parent plant ... Vegetative progeny ..	1 8	24 24	21.07	21.90	25.36
7	Parent plant ... Vegetative progeny ..	1 4	24 17	22.16	24.73	23.17
8	Parent plant ... Vegetative progeny ..	1 4	24 17	22.00	23.14	25.79
9	Parent plant ... Vegetative progeny ... do. do. ... do. do. ...	1 2 2 6	24 13 16 35	25.65	31.07 29.13 22.48	27.08 28.37 19.67
11	Parent plant ... Vegetative progeny ... do. do. ...	1 3 4	24 13 15	22.57	25.29 25.96	26.53 26.33
22	Parent plant ... Vegetative progeny ... do. do. ...	1 3 4	24 13 15	21.40	25.99 22.93	28.17 25.82
29	Parent plant ... Vegetative progeny ...	1 8	24 24	23.09	26.01	27.13
34	Parent plant ... Vegetative progeny ...	1 2	24 13	23.00	27.53	29.33

(c) *Variations in Ether Extract of Root from Plants of Different Ages.*

The results indicate that, while ether extract has developed in the root at a comparatively early age, there may be a wide difference between the figure for a parent plant and that of any member of its vegetative progeny, also between any two members of the progeny selected at random.

Table V illustrates the range of this variation found with plants of different ages. Thus, in the case of the vegetative progeny of plant No. 29 aged 24 months on the Valley Quartzite soil, there is a difference of nearly 10 per cent. between the ether extract for the parent plant and progeny No. 1. There is also a difference of nearly 11 per cent. between the maximum and minimum figures for the vegetative progeny, plants Nos. 1 and 7 respectively.

Reference to Table VI shows that, with the exception of the plants aged 35 months, the average figure for any vegetative progeny is slightly higher than that for the corresponding parent plant. It is possible that the lower range of figures for the 35 months old plants can be correlated with a decrease in ether extract with increase in age. Attention has already been drawn to this decrease in another paper published recently in this Journal⁽²⁾.

The possibility of a difference in ether extract between any two individual plants being due to a combined effect of the variations in the proportions of different sized roots and in their ether extract has also been considered. Previous work has shown a difference in ether extract according to the size of root⁽³⁾.

Table VII shows the results obtained with one series of individual plants.

The figures confirm those obtained previously as regards the variations in this respect. The ether extract tends to decrease with decreasing size of root.

Table VII.

Variations in Ether Extract of Roots of Different Sizes from Individual Plants of *Derris malaccensis* var. *sarawakensis* aged 15 months on Raub Series Soil at Serdang.

(Moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Ether Extract		
		Roots $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter	Roots $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter	Roots $\frac{3}{4}$ in. diameter and less
		per cent.	per cent.	per cent.
22	4	28.18	25.84	24.43
	5	26.36	25.41	22.81
	6	28.55	29.33	23.95
	7	25.60	25.88	22.96
Average		27.17	26.61	23.54

To illustrate the extent of the possible variation between the figures for ether extract of the roots of two individual plants due to differences in character of root the following example has been worked out. The figures are calculated on a moisture-free basis.

Parent plant	...	...	No. 22	
Serial No. of vegetative progeny	...	...	No. 4	No. 5
			ozs.	ozs.
Weight of roots	...	...	10.65	11.82
Proportion of roots:			per cent.	per cent.
Diameter $\frac{1}{2}$ to $\frac{1}{4}$ in.	...	...	25.2	29.0
-do- $\frac{1}{4}$ to $\frac{1}{8}$ in.	...	...	48.7	38.5
-do- $\frac{1}{8}$ in. and less	...	...	26.1	32.5
			100.0	100.0
Ether extract of roots:				
Diameter $\frac{1}{2}$ to $\frac{1}{4}$ in.	...	...	28.18	26.36
-do- $\frac{1}{4}$ to $\frac{1}{8}$ in.	...	...	25.84	25.41
-do- $\frac{1}{8}$ in. and less	...	...	24.43	22.81
Average ether extract	...	...	26.06	24.84

By combining the proportions of the different sized roots of vegetative progeny No. 4 with the figures for ether extract of the corresponding sizes for vegetative progeny No. 5 and *vice versa* the following figures for average ether extract are obtained, those determined by analysis being added for purposes of comparison.

			Ether Extract	
			Calculated as Indicated per cent.	Determined by Analysis per cent.
Vegetative progeny No. 4	...	...	26.06	26.06
-do- -do- No. 5	...	...	24.86	24.84

The close agreement in both cases tends to show that the combined effect of a variation in the proportions of different sized root and in the ether extract for each size of root is too small to account for the wide difference which may be found between the figures for ether extract for roots from two plants of the same progeny selected at random. This difference must therefore be due to other unknown factors.

(d) *Variations in Rotenone Content of Root from Plants of Different Ages.*

Unlike ether extract, it is not possible to make a comparison of the rotenone content of a parent plant and its vegetative progeny owing to the unreliability of the method used for the determination of rotenone when the parent plants were being analysed. The details of that method have already been published in this Journal⁽³⁾.

The first stage in that method was the extraction of the powdered root in a Soxhlet extractor with boiling carbon tetrachloride for a period of 16 hours. Investigations by Seaber⁽⁴⁾ showed that rotenone was liable to decompose slightly during prolonged boiling with carbon tetrachloride. This was confirmed by experiments carried out in this laboratory by Dr. T. A. Buckley, Chemist, who also showed that even after prolonged boiling the rotenone might not be completely extracted.

The hot carbon tetrachloride method was discontinued and the extraction of the powdered root with chloroform at room temperature substituted. As far as can be ascertained this method of extraction was proposed originally by Danckwortt and Budde, and modified by Beach. Later, further modifications in Beach's method were introduced by Jones and Graham^(5 & 6).

Although this method is open to a few minor objections, it has been tested thoroughly and found to give consistent results.

A description of the method as used in this laboratory is given in Appendix "A."

In this connexion it may be mentioned that the question of the adoption of a standard method for rotenone estimation is engaging the attention of the Imperial Institute Consultative Committee on Insecticidal Materials of Vegetable Origin. Workers both in Great Britain and other countries, notably, the United States of America, Holland and Netherlands Indies are collaborating.

As far as the present paper is concerned, only those results obtained by extraction with chloroform at room temperature will be considered. Reliable figures are available only from 24 months onwards.

As is the case with ether extract, the results indicate the possibility of a wide difference in rotenone content between any two members of a vegetative progeny selected at random.

Table VIII illustrates the range of variation found with plants aged 24 and 35 months respectively. Thus, in the case of the vegetative progeny of plant No. 5 aged 24 months on the Valley Quartzite soil there is a difference of more than 3 per cent. between the maximum and minimum figures for rotenone, plants Nos. 3 and 8 respectively.

Further, there may be wide variations between the average figures for rotenone for the same number of individual members of one vegetative progeny grown on different types of soil. This is illustrated in the case of the vegetative progeny of plant No. 29 at 24 months old and of plant No. 9 at 35 months old. In both cases there are differences of about 1.5 per cent., the figures for the Raub Series soil being consistently lower.

Table VIII.

Rotenone Content of Marketable Root from Individual Plants of *Derris malaccensis* var. *sarawakensis* at Varying Ages on Different Types of Soil at Serdang.

(Moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Age of Plants	Nature of Soil	
			Valley Quartzite	Ranb Series
		months	per cent.	per cent.
5	1	24	3.17	2.29
	2		2.64	2.36
	3		4.72	2.80
	4		3.21	2.35
	5		2.39	2.76
	6		2.94	3.69
	7		2.10	3.29
	8		1.44	3.13
Maximum			4.72	3.69
Minimum			1.44	2.29
Average			2.83	2.84
29	1	24	4.58	3.76
	2		4.91	3.88
	3		6.17	3.48
	4		4.42	3.67
	5		5.20	3.59
	6		4.99	3.88
	7		4.99	3.54
	8		5.88	3.11
Maximum			6.17	3.88
Minimum			4.42	3.11
Average			5.14	3.61
2	1	35	3.34	3.52
	2		3.30	3.29
	3		2.80	3.50
	4		2.97	3.50
	5		3.31	3.09
	6		2.84	3.24
Maximum			3.34	3.52
Minimum			2.80	3.09
Average			3.09	3.36
9	5	35	3.97	3.35
	6		3.55	2.83
	7		5.06	2.88
	8		5.68	3.12
	9		4.72	3.26
	10		4.69	2.94
Maximum			5.68	3.35
Minimum			3.55	2.83
Average			4.61	3.06

Table IX.
Relationship between Rotenone and Ether Extract for Marketable Root of *Derris malaccensis*
var. sarawakensis on Different Types of Soil at Serdang.

(The figures for rotenone and ether extract are calculated on a moisture-free basis).

Parent Plant No.	Serial No. of Vegetative Plants	Age of Plants	Nature of Soil					
			Valley Quartzite			Raub Series		
			Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract	Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract
5		months	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
	1		3.17	20.30	15.6	2.29	26.77	8.6
	2		2.64	*20.58	12.8	2.36	23.60	10.0
	3		4.72	33.26	14.2	2.80	26.32	10.6
	4	24	3.21	27.13	11.8	2.35	23.32	10.1
	5		2.39	13.31	13.1	2.76	24.07	11.5
	6		2.94	27.02	10.9	3.69	25.06	14.7
	7		2.10	15.42	13.7	3.29	29.70	11.1
			1.44	13.13	11.0	3.13	24.06	13.0
	Maximum		4.72	33.26	15.6	3.69	29.70	14.7
	Minimum		1.44	13.13	10.9	2.29	23.32	8.6
9			2.83	21.90	12.9	2.84	25.36	11.2
	5		3.97	23.93	16.6	3.35	22.43	14.9
	6		3.55	20.94	16.9	2.83	21.35	13.2
		35	5.06	23.34	21.7	2.88	18.08	15.9
	7		5.68	22.61	25.1	3.12	19.08	16.4
	8		4.72	21.40	22.1	3.26	17.38	18.7
			4.69	22.69	20.7	2.94	19.70	14.9
	9		5.68	23.93	25.1	3.35	22.43	18.7
	10		3.55	20.94	16.6	2.83	17.38	13.2
	Maximum		4.61	22.48	20.5	3.06	19.67	15.3
	Minimum							
	Average							

(e) *Correlation between Rotenone Content and Ether Extract.*

The results of analysis indicate a wide range of variation between the proportion which the amount of rotenone bears to the ether extract.

Table IX illustrates the extent of the differences found with individual members of two vegetative progeny growing on the two types of soil. Thus, in the case of the vegetative progeny of plant No. 5 aged 24 months, the figures vary from 15.6 to 10.9 per cent. for the Valley Quartzite soil and from 14.7 to 8.6 per cent. for the Raub Series soil. The average figure in both cases is, however, of the same order, 12.9 compared with 11.2 per cent.

In the case of the vegetative progeny of plant No. 9 aged 35 months, there is a still wider range of variation for the Valley Quartzite soil, the figures varying from 25.1 to 16.6 per cent. In this case also there is a marked difference between the average figures for the two types of soil, 20.5 per cent. for the Valley Quartzite soil compared with 15.3 per cent. for the Raub Series.

It is interesting to note that the average figures for the proportion of the rotenone to ether extract at 35 months are slightly higher than those at 24 months. This increase is noticeable in the case of both types of soil as the figures in Table X show.

Table X.
Proportion of Rotenone to Ether Extract for Marketable Root of
***Derris malaccensis* var. *sarawakensis* on Different**
Types of Soil at Serdang.

Age of Plants	No. of Plants	Nature of Soil					
		Valley Quartzite			Raub Series		
		Maximum	Minimum	Average	Maximum	Minimum	Average
months.		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
24	16	22.7	10.9	16.4	16.4	8.6	12.3
35	12	25.1	15.6	19.5	19.1	13.2	15.3

Derris elliptica, Sarawak creeping.(a) *Yields of Root at Different Ages.*

Similarly to *D. malaccensis* var. *sarawakensis*, marked differences were found between the weights of the air-dry marketable root from the individual members of a vegetative progeny from a single parent plant.

Table XI shows the results obtained with two series of plants harvested at the same age as the parent plants. Thus, in the case of the vegetative progeny of plant No. 7 on the Valley Quartzite soil the weights vary from 13.93 to 6.07 ozs. with an average of 10.48 ozs., while for that of plant No. 17 on the Raub Series soil the weights vary from 38.16 to 9.77 ozs. with an average of 23.60 ozs.

It is interesting to note that, while the average figure for both types of soil is of the same order for plant No. 17, in the case of plant No. 5 the average weight of root per plant on the Raub Series soil is nearly three times as great as on the Valley Quartzite soil.

Comparing the vegetative progeny with the respective parent plants the figures show that the average weight of root on both types of soil is slightly greater in the case of the vegetative progeny for plant No. 17 than for plant No. 7. The average weight of root for the progeny of No. 17 is 23.53 ozs. compared with 19.10 ozs. for No. 7. In the case of plant No. 17 this represents a two-fold increase but for No. 7 the increase is approximately ten-fold.

Reference to Table XII, in which the average weights of root at different ages are compared, will show that such an increase is not abnormal.

The results would appear to indicate that under suitable conditions a marked root development is a feature of this species. Attention has been drawn previously to the high yield of root obtained in manurial trials with this species(?).

Table XI.

Comparative Yields of Air-Dry Marketable Root from Individual Plants of *Derris elliptica*, Sarawak creeping, 24 months old on Different Types of Soil at Serdang.

Parent Plant, No. 7		2.36 ozs.	
Serial No. of Vegetative Progeny		Nature of Soil	
		Valley Quartzite	Raub Series
		ozs.	ozs.
3	...	12.38	27.76
4	...	9.21	35.41
5	...	13.93	20.63
6	...	13.83	29.59
7	...	6.07	25.61
8	...	12.10	28.47
9	...	8.25	28.78
10	...	8.04	25.50
Maximum	...	13.93	35.41
Minimum	...	6.07	20.63
Average	...	10.48	27.72
Parent Plant, No. 17		9.77 ozs.	
3	...	25.50	38.16
4	...	31.46	36.36
5	...	33.44	14.67
6	...	16.44	36.15
7	...	16.22	22.89
8	...	12.88	17.74
9	...	24.58	13.05
10	...	27.12	9.77
Maximum	...	33.44	38.16
Minimum	...	12.88	9.77
Average	...	23.46	23.60

Table XII.

Average Weights of Air-Dry Marketable Root from Individual Plants of *Derris elliptica*, Sarawak creeping, on Different Types of Soil at Serdang.

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Nature of Soil		
				General Nursery	Valley Quartzite	Raub Series
2	Parent plant ...	1	months 24	ozs. 2.33	ozs.	ozs.
	Vegetative progeny ...	3	17		15.89	16.49
3	Parent plant ...	1	24	5.50		
	Vegetative progeny ...	3	13		8.67	5.50
	do. do. ...	4	15		11.75	8.75
5	Parent plant ...	1	24	1.09		
	Vegetative progeny ...	4	17		16.13	11.35
7	Parent plant ...	1	24	2.36		
	Vegetative progeny ...	2	16		6.70	21.95
	do. do. ...	8	24		10.48	27.72
8	Parent plant ...	1	24	2.86		
	Vegetative progeny ...	2	16		11.50	15.35
9	Parent plant ...	1	24	3.20		
	Vegetative progeny ...	2	13		11.65	11.80
	do. do. ...	2	16		12.50	14.25
	do. do. ...	6	34		23.14	30.43
10	Parent plant ...	1	24	2.12		
	Vegetative progeny ...	2	16		11.60	14.75
11	Parent plant ...	1	24	4.23		
	Vegetative progeny ...	2	16		14.85	17.20
12	Parent plant ...	1	24	4.69		
	Vegetative progeny ...	2	16		16.10	12.60
13	Parent plant ...	1	24	4.83		
	Vegetative progeny ...	4	17		25.20	16.45
16	Parent plant ...	1	24	9.00		
	Vegetative progeny ...	3	13		6.87	6.50
	do. do. ...	4	15		12.50	18.27
17	Parent plant ...	1	24	9.77		
	Vegetative progeny ...	8	24		23.46	23.60
31	Parent plant ...	1	24	4.06		
	Vegetative progeny ...	6	34		24.01	25.54

As is the case with *D. malaccensis* var. *sarawakensis* there would appear to be on both types of soil a gradual increase in yield of root with increase in age of plant. In the case of the Valley Quartzite soil the figures show the increase to be continuous up to 35 months, the limit of the experiment, but with the Raub Series soil the yields at 24 and 35 months are of the same order. Table XIII gives the details for each age of harvesting.

Table XIII.

**Yields of Air-Dry Marketable Root from Individual Plants of
Derris elliptica, Sarawak creeping, of Varying Ages on
Different Types of Soil at Serdang.**

Age of Plants	No. of Plants	Valley Quartzite			Raub Series		
		Maximum	Minimum	Average	Maximum	Minimum	Average
months		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
13	10	15.50	4.20	8.56	16.20	3.90	7.14
15	8	15.20	7.70	12.11	22.20	6.90	13.51
16	16	17.60	5.80	12.44	33.30	5.30	14.72
17	16	28.60	6.10	18.29	28.30	8.00	15.13
24	16	33.44	6.47	16.96	38.16	9.77	25.66
34	12	34.10	16.38	23.58	36.31	13.76	27.99

(b) *Variations in Character of Root from Individual Plants.*

The variations in character of root from individual plants were found to be much more marked with this species than with *D. malaccensis* var. *sarawakensis*.

The results of two series of determinations are shown in Table XIV.

The figures confirm the results obtained with *D. malaccensis* var. *sarawakensis* regarding the absence of any correlation between size of roots and root development. Thus, in the case of Nos. 4 and 7 of the vegetative progeny from parent plant No. 16 there is a difference of over 20 per cent. in the proportion of the large-sized roots, $\frac{1}{2}$ to $\frac{1}{4}$ in., although the total yield of root in both cases is of the same order amounting to more than 1 lb. Such a yield of root may be considered well above the average.

(c) *Variations in Ether Extract of Root from Plants of Different Ages.*

The results indicate again the possibility of considerable differences at all ages between the figures for a parent plant and that of any member of its vegetative progeny, also between any two members of the progeny selected at random.

Table XIV.

Proportions by Weight of Roots of Varying Sizes from Individual Plants of *Derris elliptica*, Sarawak creeping, 15 months old on Raub Series Soil at Serdang.

Parent Plant No.	Serial No. of Vegetative Progeny	Weight of Air-dry Marketable Root	Proportion of Roots		
			$\frac{1}{2}$ to $\frac{1}{4}$ in. diameter	$\frac{1}{4}$ to $\frac{1}{8}$ in. diameter	$\frac{1}{8}$ in. diameter and less
		ozs.	per cent.	per cent.	per cent.
3	4	9.85	41.2	35.8	23.0
	5	6.86	30.2	36.8	33.0
	6	10.81	23.4	44.0	32.6
	7	7.44	36.6	40.2	23.2
Average		8.74	32.8	39.3	27.9
16	4	17.40	43.6	38.8	17.6
	5	15.80	25.7	46.2	28.1
	6	22.20	34.4	37.0	28.6
	7	17.70	22.5	51.3	26.2
Average		18.28	31.6	43.3	25.1

Table XV illustrates the range of variation found with plants of different ages. Thus, for the vegetative progeny of plant No. 7 at 24 months on Valley Quartzite soil there is a difference of more than 10 per cent. between the ether extract for the parent plant and vegetative progeny No. 10. There is also at the same age a difference of nearly 6 per cent. between the maximum and minimum figures of the vegetative progeny, plants Nos. 5 and 10 respectively.

Reference to Table XVI shows that, with very few exceptions, the average figure for any vegetative progeny is less than that for the corresponding parent plant.

Further, the lower average figure for Raub Series soil compared with Valley Quartzite soil is also of interest.

Table XV.

Variations in Ether Extract of Marketable Root from Individual Plants of *Derris elliptica*, Sarawak Creeping, at Varying Ages on Different Types of Soil at Serdang.

(Moisture-free basis)

Serial No. of Vegetative Progeny	Age of Plants	Nature of Soil	
		Valley Quartzite	Raub Series
	months	per cent.	per cent.
(a) Parent Plant, No. 16, 24 months old, 25.90 per cent.			
1 ...	13	26.36	26.10
2 ...		23.30	27.25
3 ...		20.78	26.66
Average		23.48	26.47
4 ...	15	26.07	21.45
5 ...		22.72	24.67
6 ...		23.15	22.03
7 ...		20.82	23.71
Average		23.19	22.97
(b) Parent Plant, No. 2, 24 months old, 25.36 per cent.			
1 ...	17	24.05	18.69
2 ...		29.22	20.05
3 ...		26.98	22.36
4 ...		24.67	23.36
5 ...		22.24	20.52
6 ...		24.50	24.74
7 ...		21.42	22.18
8 ...		19.74	22.87
Average		24.10	21.85
(c) Parent Plant, No. 7, 24 months old, 29.13 per cent.			
1 ...	16	26.61	22.55
2 ...		28.50	24.32
Average		27.56	23.44
3 ...	24	23.39	19.11
4 ...		20.80	18.43
5 ...		24.61	16.46
6 ...		19.83	19.77
7 ...		22.65	19.86
8 ...		19.82	20.83
9 ...		24.27	18.04
10 ...		18.92	20.85
Average		21.79	19.17
(d) Parent Plant, No. 9, 24 months old, 29.65 per cent.			
1 ...	13	24.24	24.96
2 ...		23.33	24.44
Average		23.79	24.70
3 ...	16	25.14	23.15
4 ...		24.75	19.38
Average		24.95	21.27
5 ...	34	27.41	22.01
6 ...		27.37	14.27
7 ...		27.55	17.23
8 ...		24.67	18.49
9 ...		24.24	19.52
10 ...		24.23	18.75
Average		25.91	18.38

Table XVI.

Average Ether Extract of Marketable Root from Individual Plants of
Derris elliptica, Sarawak creeping, on Different
 Types of Soil at Serdaung.

(Moisture-free basis)

Reference No. of Plant	Details of Plants	No. of Plants Harvested	Age of Plants	Nature of Soil		
				General Nursery	Valley Quartzite	Raub Series
			months	per cent.	per cent.	per cent.
2	Parent plant ...	1	24	25.36	24.10	21.85
	Vegetative progeny ...	8	17			
3	Parent plant ...	1	24	27.47	25.82	23.42
	Vegetative progeny ...	3	13			
	do. do. ...	4	15			
5	Parent plant ...	1	24	26.24	24.33	21.26
	Vegetative progeny ...	4	17			
7	Parent plant ...	1	24	29.13	27.56	23.44
	Vegetative progeny ...	2	16			
	do. do. ...	8	24			
8	Parent plant ...	1	24	29.12	26.25	21.02
	Vegetative progeny ...	2	16			
9	Parent plant ...	1	24	29.65	23.79	24.70
	Vegetative progeny ...	2	13			
	do. do. ...	2	16			
	do. do. ...	6	34			
10	Parent plant ...	1	24	27.67	24.96	23.00
	Vegetative progeny ...	2	16			
11	Parent plant ...	1	24	28.47	22.53	21.62
	Vegetative progeny ...	2	16			
12	Parent plant ...	1	24	29.43	23.19	18.13
	Vegetative progeny ...	2	16			
13	Parent plant ...	1	24	26.59	24.78	19.29
	Vegetative progeny ...	4	17			
16	Parent plant ...	1	24	25.90	23.48	26.47
	Vegetative progeny ...	3	13			
	do. do. ...	4	15			
17	Parent plant ...	1	24	24.99	25.88	21.12
	Vegetative progeny ...	8	24			
31	Parent plant ...	1	24	25.94	25.75	23.54
	Vegetative progeny ...	6	34			

The possibility of a difference in ether extract between any two individual plants being due to a combined effect of the variation in the proportions of different sized roots and their ether extract was similarly considered. Previous work has shown a difference in ether extract according to the size of root ⁽³⁾.

Table XVII shows the results obtained with one series of individual plants.

The figures confirm those obtained previously as regards the variations in this respect. The roots with a diameter of $\frac{1}{4}$ to $\frac{1}{2}$ in. have the highest ether extract, followed by those with a diameter of $\frac{1}{2}$ to $\frac{3}{4}$ in. The very fine roots with a diameter of $\frac{1}{8}$ in. and less have the lowest ether extract.

Table XVII.

Variations in Ether Extract of Roots of Different Sizes from Individual Plants of *Derris elliptica*, Sarawak creeping, aged 15 months on Raub Series Soil at Serdang.

(Moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Ether Extract		
		Roots $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter	Roots $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter	Roots $\frac{1}{8}$ in. diameter and less
3	4	26.56	26.88	22.25
	5	22.30	26.34	22.73
	6	22.40	24.63	21.71
	7	25.25	27.65	21.64
Average		24.13	26.38	22.08

To illustrate the extent of the possible variation between the figures for ether extract of the roots of two individual plants due to differences in character of root a similar example to that taken in the case of *D. malaccensis* var. *sarawakensis* will be worked out. The figures are calculated on a moisture-free basis.

Parent plant	...	No. 3	
Serial No. of vegetative progeny	...	No. 4	No. 6
		ozs.	ozs.
Weight of roots	...	9.07	9.95
Proportion of roots:		per cent.	per cent.
Diameter $\frac{1}{2}$ to $\frac{3}{4}$ in.	...	41.2	23.4
-do- $\frac{1}{4}$ to $\frac{1}{2}$ in.	...	35.8	44.0
-do- $\frac{1}{8}$ in. and less	...	23.0	32.6
		100.0	100.0

Ether extract of roots:

Diameter $\frac{1}{2}$ to $\frac{1}{4}$ in.	...	...	26.56	22.40
-do- $\frac{1}{4}$ to $\frac{1}{8}$ in.	...	...	26.88	24.63
-do- $\frac{1}{8}$ in. and less	...	...	22.25	21.71
Average ether extract	...	...	25.68	23.15

Combining the proportions of the different sized roots of vegetative progeny No. 4 with the figures for ether extract of the corresponding sizes for vegetative progeny No. 6 and *vice versa*, the following figures for average ether extract are obtained, those determined by analysis being added for purposes of comparison.

			Ether Extract	
			Calculated as Indicated per cent.	Determined by Analysis per cent.
Vegetative progeny No. 4	...	...	25.29	25.68
-do- -do- No. 5	...	...	23.05	23.15

Similarly to *D. malaccensis* var. *sarawakensis*, the close agreement in both cases tends to show that the combined effect of a variation in the proportions of different sized roots and in the ether extract for each size of root is too small to account for the wide difference which may be found between the figures for ether extract for roots from two plants of the same progeny selected at random.

(d) *Variations in Rotenone Content of Root from Plants of Different Ages.*

As explained in the case of *D. malaccensis* var. *sarawakensis*, only the results obtained with chloroform extraction at room temperature will be mentioned. Consideration is therefore restricted to the figures obtained with plants aged 24 and 34 months respectively.

As in the case of ether extract, the results indicate the possibility of a wide difference in rotenone content between any two members of a vegetative progeny selected at random.

Table XVIII illustrates the range of variation found with plants of the ages mentioned above. Thus, in the case of the vegetative progeny of plant No. 17, aged 24 months, on the Raub Series soil there is a difference of about 2 per cent. between the maximum and minimum figures, plants Nos. 5 and 8 respectively.

There may also be wide variations between the average figures for rotenone for the same number of individual members of one vegetative progeny grown on different types of soil. This is illustrated in the case of the vegetative progeny of plant No. 17 at 24 months old and of plant No. 9 at 34 months old. In the first case there is a difference of about 1.5 per cent. in the figures and in the second one of nearly 2.5 per cent. In both cases the figures for the Raub Series soil are lower.

Table XVIII.

Rotenone Content of Marketable Root from Individual Plants of
Derris elliptica, Sarawak creeping, at Varying Ages on
Different Types of Soil at Serdang.

(Moisture-free basis)

Parent Plant No.	Serial No. of Vegetative Progeny	Age of Plants	Nature of Soil	
			Valley Quartzite	Raub Series
7	3	months	per cent.	per cent.
	4	24	7.68	5.89
	5		6.08	5.49
	6		7.80	5.02
	7		5.78	5.89
	8		7.02	6.05
	9		5.75	6.35
	10		7.08	5.38
			5.47	5.98
Maximum			7.80	6.35
Minimum			5.47	5.02
Average			6.58	5.76
17	1	24	8.76	7.06
	2		8.52	6.75
	3		8.41	7.11
	4		7.65	6.18
	5		7.50	7.12
	6		8.58	6.48
	7		7.33	6.55
	8		8.73	5.15
Maximum			8.76	7.12
Minimum			7.33	5.15
Average			8.19	6.55
9	5	34	8.55	7.05
	6		8.99	5.06
	7		9.25	5.79
	8		7.80	5.70
	9		7.72	5.98
	10		7.94	6.28
Maximum			9.25	7.05
Minimum			7.72	5.06
Average			8.37	5.98
31	1	34	8.93	6.98
	2		8.31	8.06
	3		8.06	8.34
	4		7.30	6.76
	5		7.28	7.85
	6		8.84	8.16
Maximum			8.93	8.34
Minimum			7.28	6.76
Average			8.12	7.69

(e) *Correlation between Rotenone Content and Ether Extract.*

Compared with *D. malaccensis* var. *sarawakensis* there is a narrower range of variation as regards the proportion which the amount of rotenone bears to the ether extract.

Table XIX.

Relationship between Rotenone and Ether Extract for Marketable Root of *Derris elliptica*,
Sarawak creeping, on Different Types of Soil at Serdang.

(The figures for rotenone and ether extract are calculated on a moisture-free basis.)

Parent Plant No.	Serial No. of Vegetative Progeny	Age of Plants	Nature of Soil					
			Valley Quartzite			Raub Series		
			Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract	Rotenone	Ether Extract	Proportion of Rotenone to Ether Extract
17	1 2 3 4 5 6 7 8	months 24	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
			8.76	27.98	31.3	7.06	21.51	32.8
			8.52	26.52	32.1	6.75	20.45	33.0
			8.41	26.18	32.1	7.11	23.43	30.4
			7.65	23.81	32.1	6.18	20.54	30.1
			7.50	24.43	30.6	7.12	22.13	32.2
			8.58	26.85	32.0	6.48	20.61	31.4
			7.33	22.09	32.3	6.55	22.60	29.0
			8.73	28.54	30.6	5.15	17.72	29.1
31	Maximum Minimum Average	34	8.76	28.54	32.3	7.12	23.43	33.0
			7.33	22.69	30.6	5.15	17.72	29.0
			8.19	25.88	31.7	6.55	21.12	31.0
			8.93	27.26	32.8	6.98	21.74	32.1
			8.31	25.51	31.4	8.06	25.05	32.2
			8.06	24.92	31.1	8.34	25.65	32.5
31	1 2 3 4 5 6	34	7.30	23.43	31.1	6.76	19.31	35.0
			7.28	23.40	31.1	7.85	23.93	32.8
			8.84	28.00	31.6	8.16	25.58	31.9
			8.93	28.00	32.8	8.34	25.65	35.0
			7.28	23.40	31.1	6.76	19.31	31.9
			8.12	25.75	31.5	7.69	23.54	32.8

Table XIX shows the figures obtained with individual members of two vegetative progeny growing on the two types of soil. Thus, in the case of the vegetative progeny of plant No. 17, aged 24 months, the figures vary only from 32.3 to 30.6 per cent. for the Valley Quartzite soil and from 33.0 to 29.0 per cent. for the Raub Series soil. The average figure in both cases is also of the same order, 31.7 compared with 31.0 per cent.

It is interesting to note that the average figures for the proportion of rotenone to ether extract are again slightly higher at 34 months than at 24 months. This increase is noticeable in the case of both types of soil as the figures in Table XX show.

Table XX.

Proportion of Rotenone to Ether Extract for Marketable Root of *Derris elliptica*, Sarawak creeping, on Different Types of Soil at Serdang.

Age of Plants	No. of Plants	Nature of Soil					
		Valley Quartzite			Raub Series		
		Maximum	Minimum	Average	Maximum	Minimum	Average
months		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
24	16	32.8	28.9	30.9	33.0	28.7	30.5
34	12	33.3	31.1	31.9	35.5	30.6	32.8

Summary of Results of Investigation.

The results of the investigation may be summarized as follows:—

(a) *Yield of Root.*

- (i) The average weight of root from an individual plant of a vegetative progeny in the case of both species is much greater than that of the parent plant at the same age. The increase can doubtless be attributed to the wider spacing.
- (ii) Wide variations are found at all ages between the weights of root from individual plants of the same vegetative progeny under the conditions of the experiment.
- (iii) These variations apply equally to both species, also to the two types of soil on which the experiment has been carried out.
- (iv) The yield of root increases with the age of plant. In the case of *D. malaccensis* var. *sarawakensis*, the yield tends to remain stationary after 24 months, but with *D. elliptica*, Sarawak creeping, a gradual increase is shown up to 34 months.

- (v) *D. elliptica*, Sarawak creeping, gives a markedly greater yield of root per plant at all ages than *D. malaccensis* var. *sarawakensis*. The former species would appear to be characterized by a marked root development.

(b) *Variation in Character of Root.*

There may be wide variations in the character of the root from individual plants. These variations are more marked with *D. elliptica*, Sarawak creeping, than with *D. malaccensis* var. *sarawakensis*.

(c) *Ether Extract of Root.*

- (i) The development of toxicity takes place at a much earlier age than previously anticipated. Thus, the proportion of ether extract in the root of a parent plant aged 24 months may be less than that of its vegetative progeny aged 18 months.
- (ii) Wide variations may exist in ether extract between a parent plant and any member of its vegetative progeny, also between any two members of the progeny selected at random. The difference may be of the order of 10 per cent.
- (iii) These variations apply equally to both species and to the two types of soil.
- (iv) The ether extract varies with the size of root. In the case of *D. malaccensis* var. *sarawakensis* the ether extract decreases with decreasing size of root; with *D. elliptica*, Sarawak creeping, the roots varying in diameter from $\frac{1}{4}$ to $\frac{1}{8}$ in. diameter have the highest ether extract, followed by those $\frac{1}{2}$ to $\frac{1}{4}$ in. The roots having a diameter of $\frac{1}{8}$ in. and less are lowest in ether extract.
- (v) The differences in ether extract between different sized roots combined with the variations in character between the roots of individual plants are, however, insufficient to account for the wide variations referred to above.
- (vi) In the case of *D. malaccensis* var. *sarawakensis* the average figure for ether extract for any vegetative progeny up to 24 months was slightly higher than that for the parent plant at 24 months. After 24 months there was a tendency for the ether extract to decrease. These observations apply to both types of soil. For *D. elliptica*, Sarawak creeping, the average figure for any vegetative progeny was less than that for the corresponding parent plant. This decrease was more marked in the case of the Raub Series soil than for the Valley Quartzite soil. There was no tendency for the ether extract to decrease with increasing age of plant.

(d) *Rotenone Content of Root.*

- (i) Comparative figures for rotenone for parent plant and vegetative progeny are not available owing to the unreliability of the method previously used. A description is given of the revised method which gives consistent results.
- (ii) Similarly to ether extract, the results indicate the possibility of a relatively wide difference in rotenone content between any two members of a vegetative progeny selected at random. The difference is more marked with *D. malaccensis* var. *sarawakensis* than with *D. elliptica*, Sarawak creeping, even though the proportion of rotenone to ether extract is less for the first than for the second species.
- (iii) There may also be relatively wide variations between the average figures for rotenone for the same number of members of one vegetative progeny grown on the two types of soil. In both cases the figures for the Raub Series soil are slightly lower.

(e) *Proportion of Rotenone to Ether Extract.*

- (i) In the case of *D. malaccensis* var. *sarawakensis* there was a wide range of variation in the proportion of rotenone to ether extract between the individual members of a vegetative progeny irrespective of type of soil. The range of variation was much narrower for *D. elliptica*, Sarawak creeping.
- (ii) For plants aged 24 months, the average figures for the proportions of rotenone to ether extract were as follows:—

			per cent.
<i>D. malaccensis</i> var. <i>sarawakensis</i>	...	...	14.4
<i>D. elliptica</i> , Sarawak creeping	...	...	30.7

- (iii) There appeared to be a slight tendency for the proportion of rotenone to ether extract to increase with increasing age of plant.

No explanation can yet be offered to explain the variations both in yield of root and toxic content.

From the point of view of these characteristics the results demonstrate again the potential value of *D. elliptica*, Sarawak creeping, as a satisfactory type for planting on a large scale.

The above type, which is characterized by a high yield of root combined with medium rotenone and ether extract, meets the present demand both of the English and American markets.

In spite of the variations, the results show that the average figure for rotenone, calculated on a 10 per cent. moisture basis (this figure represents the average moisture content of well-dried commercial consignments of root), would be well in excess of 5 per cent. The latter figure is the minimum on which root can be offered on a rotenone basis. A figure of 5 per cent. on a 10 per cent. moisture basis is equivalent

to 5.56 per cent. on a moisture-free basis. Reference to Table XVIII will show that the average figure for any group of plants on either type of soil is in excess of this figure.

The figures for rotenone for *D. malaccensis* var. *sarawakensis*, are too low to admit of this type of root being sold on this basis. It can be sold only on a basis of ether extract.

At present, a much lower price is offered for root sold on an ether extract basis compared with a rotenone basis. The latest average Singapore prices are \$8 (Straits currency) per picul (133½ lbs.) for root sold on an ether extract basis compared with \$18 per picul for root sold on a rotenone basis.

Outline of Further Work.

While the isolation of a clone in which high yield of root is combined with high toxic content still remains the final objective of the work, the application of the results of the investigation to present estate practice must not be overlooked.

The multiplication of stocks of high-quality planting material derived both from individual plants and from mixed vegetative progeny of an individual plant of similar quality is therefore being undertaken.

For example, in the case of *D. malaccensis* var. *sarawakensis* cuttings from an individual plant which gave the following figures at 24 months have been established.

				ozs.
Weight of air-dry marketable root	...	...	...	34.74
				per cent.
				(Moisture-free basis)
Rotenone	...	...	...	4.58
Ether extract	...	...	...	32.76

Similarly for *D. elliptica*, Sarawak creeping, cuttings from a group of mixed vegetative progeny which gave the following average figures at 24 months have also been established. The vegetative progeny were all derived from a single parent plant.

				ozs.
Weight of air-dry marketable root	...	...	...	23.04
				per cent.
				(Moisture-free basis)
Rotenone	...	...	...	7.78
Ether extract	...	...	...	24.73

With regard to estate practice the important lines of work are as follows:—

- (a) Yields of root at different ages with varying planting distances.
- (b) Average toxic content of root at different ages with varying planting distances.
- (c) The extent to which a decrease in the toxic content of the roots of plants in one generation is likely to be maintained in the next generation.

The last line of work applies more particularly to *D. elliptica*, Sarawak creeping, in which the figure for the average toxic content of a vegetative progeny was invariably less than that for the parent plant.

Experiments on these lines have been and are being laid down with planting material of toxic content of known limits.

As indicated previously, no explanation can at present be offered for the wide variation in the figures for the yield of root and toxic content of members of a vegetative progeny. Following a suggestion by Dr. T. W. Brown, Botanist, small-scale experiments are being laid down to ascertain whether these characteristics are influenced by the size of the original cutting.

Acknowledgments.

The writers wish to acknowledge the assistance of Mr. J. Lambourne (retired), formerly Agriculturist, with the field side of the investigation; also that of Inche Othman bin Mohamed Lela, Malay Agricultural Assistant, Grade II, and Inche Nuruddin bin Maruf, Malay Agricultural Subordinate (Probationer), for their help in the analytical work.

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Received for publication 14th June, 1939.

APPENDIX 'A.'

Method for Estimation of Rotenone.

Thirty grammes of the finely powdered root are placed in a bottle, 300 cc. of chloroform added and the bottle with the contents is shaken mechanically for two hours. An end-over-end type of shaker is preferable so as to ensure thorough mixing of the powder and solvent.

The bottle is allowed to stand overnight and shaken for a further hour in the morning.

The mixture is filtered as rapidly as possible, using a filter large enough to hold the whole bulk, and 200 cc. of the filtrate are collected in a graduated flask. The filter is covered with a clock glass to prevent evaporation of the chloroform during the operation.

The above volume of filtrate, which is taken to contain the extract of 20 gm. of root, is distilled on a steam-bath to a small volume and the remainder of the solvent is removed under reduced pressure.

The residue is dissolved in 10 cc. of warm carbon tetrachloride, which is distilled off under reduced pressure. This procedure is repeated a second time to ensure complete removal of chloroform.

Twenty-five cc. of carbon tetrachloride, saturated with rotenone at the temperature of the Electrolux cold cabinet, are added to the residue, which is dissolved by warming.

The hot solution is transferred to a small wide-mouthed flask, the distillation flask rinsed with a few cc. of carbon tetrachloride and the rinsings transferred to the wide-mouthed flask. The final volume of liquid in the flask is adjusted to 25 cc. by distillation.

In the case of root in which the rotenone content is known to be of the order of 6 per cent. or less, e.g. *Derris malaccensis*, Kinta type, *D. malaccensis* var. *sarawakensis* or *D. elliptica*, Sarawak creeping, 1 gm. of pure rotenone is placed in the small wide-mouthed flask before the contents of the distillation flask are transferred thereto. An allowance must be made for this rotenone in the final calculation.

The flask is closed with a cork and transferred to the Electrolux cold cabinet. It is stored for two days, during which period the rotenone-carbon tetrachloride complex crystallizes.

The complex is filtered on a Gooch crucible, fitted with a paper disc, and washed with ice-cold carbon tetrachloride saturated with rotenone. About 15 cc. of the solvent are used.

After standing in the air for three or four hours the complex in the crucible is broken up by means of a spatula to accelerate drying.

The volume of the mother liquor and washings is reduced to 15 cc. by distillation and, after seeding with rotenone, the flask is corked and returned to the cold cabinet for one day. A second crop of complex crystals separates and is filtered on a Gooch crucible fitted with a paper disc.

The complex from the second crystallization is allowed to dry as described previously and added to that originally obtained. The total weight of air-dry complex is recorded.

The complex is triturated with alcohol (saturated with rotenone at the ordinary temperature) in the proportion of 5 cc. of alcohol for each gramme of complex.

The mixture is left to stand overnight before filtering on a Gooch crucible fitted with a paper disc.

The rotenone is dried in the steam-oven and weighed; it should be broken up after one hour's drying, thereby reducing the period required to complete this operation.

A deduction of 0.07 gm. of rotenone must be made in all cases in respect of the excess rotenone in the second crop of complex consequent upon the reduction of the volume of 40 cc. of carbon tetrachloride saturated with rotenone to 15 cc.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

2nd Quarter, 1939.

*Prepared by the Economics Branch of the Department of Agriculture, S.S. and
F.M.S., in collaboration with the Field Branch of the Department.*

Rainfall.

During the first two months of the quarter under review normal rainfall was experienced in most parts of the Peninsula, and June was a dry month. In Kedah, Province Wellesley and Penang, the dry weather experienced during the first quarter extended into April, but in the latter Settlements abnormally heavy rains fell in May and June. The quarter was exceptionally dry in Malacca with the exception of the Central District which experienced a wet May. In Johore Central, June rainfall was above the average, and similar conditions were experienced in the inland districts of Pahang.

Prices.

Prices paid for small-holding rubber during the quarter are summarized in Tables I and II.

The value of coupons continued high, rising from \$26.50 in April to \$28.80 in May and falling in June to \$27.50 per picul equivalent. In Kelantan coupons were considerably lower, ranging from \$20.60 to \$23.15, and in Kedah they ranged from \$24 to \$27.50. Uncoupons rubber varied from \$5 per picul at the beginning of April to \$7 at the close of the quarter. In Penang it rose to \$15 per picul in May (Province Wellesley \$10), but fell back to \$7 in June.

Production.

Table III gives production of rubber on small holdings during the quarter. Small-holding production was 30 per cent. of the total production of the quarter, whereas small holdings represent 39 per cent. of the total planted area of rubber in Malaya.

Quality of Rubber.

The Selangor report states that rubber is now mostly prepared in the form of reasonable quality smoked sheet. There are now 30 members participating in a co-operative smoke house at Ijok, and a new smoke house on a similar basis has been constructed at Sijangkang. Other individual smoke houses have been erected in the State during the quarter.

The Pahang report stresses the fact, previously referred to in these summaries, that good quality smoked sheet from small holdings is dependent upon a sufficiently high premium being forthcoming. The report states that the quality of sheet entered

Table I.
Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul of 133 1/3 lbs.)

2nd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			APRIL					
Smoked sheet	34.00-36.50	28.80-34.70	32.00-35.00	32.00-34.00	29.00-36.25	34.00-35.50	32.00-36.00	30.70-36.00
Unsmoked sheet	32.00-35.50	25.50-33.50	31.00-33.80	30.00-33.50	28.50-34.00	33.00-34.50	30.50-35.00	30.00-36.20
Scrap	22.00-23.50	27.00-27.50	27.40-28.00	—	—	23.00-30.00	27.00-29.00	25.00-30.00
			MAY					
Smoked sheet	34.00-36.00	32.00-35.70	33.00-35.80	33.00-35.20	30.00-35.50	34.00-35.50	31.00-36.40	32.50-35.50
Unsmoked sheet	32.00-35.50	30.00-35.00	30.00-34.00	31.00-34.70	29.00-33.50	32.00-34.50	31.00-35.40	29.50-34.80
Scrap	23.00-28.50	26.00-29.00	27.20-29.10	—	—	23.00-30.50	26.50-29.40	26.80-30.00
			JUNE					
Smoked sheet	34.00-36.00	32.00-36.00	30.80-36.25	32.00-36.10	31.25-40.00	35.00-36.50	32.90-37.50	33.00-36.00
Unsmoked sheet	33.00-36.00	30.50-35.00	29.00-35.10	31.00-35.00	31.00-34.00	34.00-35.50	32.50-36.50	32.00-35.00
Scrap	23.50-27.50	26.00-28.00	28.50-30.50	—	—	29.00-33.00	28.00-30.10	27.50-31.00

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Table II.
Mean of Highest and Lowest Rubber Prices Paid by Local Dealers
at a number of Centres in each State.
(In Straits dollars per picul of 133 1/3 lbs.)

2nd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			APRIL					
Smoked sheet	34.25-36.10	32.32-34.08	33.02-34.13	32.30-33.70	31.80-33.53	34.17-35.00	32.62-34.50	32.39-34.11
Unsmoked sheet	32.88-35.00	30.55-32.33	31.10-32.53	30.90-32.70	30.30-31.45	33.17-34.00	31.28-32.88	31.14-33.34
Scrap	24.95-26.50	27.00-27.50	27.40-28.00	—	—	28.17-29.33	27.17-28.33	26.96-28.29
			MAY					
Smoked sheet	34.00-35.55	33.39-34.65	34.12-35.06	33.38-35.04	32.89-34.16	34.17-35.33	32.92-35.00	33.17-34.72
Unsmoked sheet	32.88-34.55	32.13-33.55	31.35-32.94	32.00-33.92	31.40-32.18	32.83-34.17	31.32-33.30	31.73-33.42
Scrap	25.50-26.67	26.00-29.00	27.20-29.10	—	—	28.50-30.00	27.20-28.13	28.15-29.15
			JUNE					
Smoked sheet	34.25-36.00	33.87-35.58	33.93-35.62	33.80-35.32	33.59-35.59	35.33-36.33	34.60-35.70	34.41-35.15
Unsmoked sheet	33.88-35.18	32.38-33.90	31.38-33.65	32.70-34.50	32.20-33.40	34.50-35.33	33.62-34.75	32.83-34.39
Scrap	25.25-25.75	26.00-28.00	28.50-30.50	—	—	30.50-31.83	28.33-29.37	28.72-30.05

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Table III
Production of Rubber on Small Holdings.
(in tons)

	Total First Half-Year 1938	1st Quarter 1939	2nd Quarter 1939	Total First Half-Year 1939
Federated Malay States ...	33,650	10,875	9,729	20,604
Straits Settlements ...	6,298	2,123	2,054	4,177
Unfederated Malay States ...	30,788	11,450	10,562	22,012
TOTAL MALAYA ...	70,736	24,448	22,345	46,793

in the mukim rubber competitions shows clearly that small-holders know how to make good quality sheet rubber, but that, at the present time, the economic incentive is lacking. The report adds, however, that although many of the smoke houses are not in regular use, ten new cabinets were erected during the quarter.

In Kelantan there are now 26 smoke cabinets, while nine are under construction and twenty awaiting construction; approximately twelve of these smoke houses are worked or will be worked co-operatively. The premium in this State for good F.A.Q. smoked sheet has been from \$2.50 to \$3 per picul throughout the quarter.

In Taiping, Perak, smoked sheet has received a premium of \$2 per picul, and three new smoke cabinets have been erected, while existing ones have remained in operation.

In Perak North no smoking was carried out during the first two months of the quarter owing to continued wet weather and padi harvesting. In Perak South three demonstration cabinets were erected in April.

General Conditions on Holdings.

Conditions on small holdings continue to be reasonably satisfactory. Many Chinese owners are clean weeding and eradicating *lalang* grass. In general it appears that it is only the fear that their coupon allowance may be reduced which makes most small-holders carry out weeding or slashing of undergrowth.

Soil erosion on hilly areas is receiving special attention in view of the new planting and replanting now permitted.

Tapping.

The result of the quarterly survey of areas of small holdings out of tapping is summarized in Tables IV and V, and it will be seen that in most States the number of areas not in tapping increased, but the increase for the whole of Malaya was only 1 per cent., i.e. from 42 per cent. in March to 43 per cent. in June.

Table IV.
Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less
than 100 Acres at the end of June, 1939.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	30,187	12,300	34	Klang	16,143	10,500	65	Seremban	23,639	21,700	92	Raub	10,534	9,300	88
Kinta	38,874	7,800	20	Kuala Langat	23,881	12,200	51	Tampin	21,896	18,200	83	Kuala Lipis	15,457	5,700	37
Kuala Kangsar	92,166	68,200	74	Ulu Langat	45,012	27,900	62	Kuala Pilah	31,832	24,500	77	Bentong	12,224	3,200	26
Upper Perak	15,590	5,900	38	Ulu Selangor	31,463	16,000	51	Jekebu	9,097	1,000	18	Other Districts†	40,373	22,300	48
Larut & Selama	43,132	4,300	10	Kuala Lumpur	20,277	14,400	71	Port Dickson	11,133	10,900	98				
Krian	9,408	8,400	89	Kuala Selangor†	8,417	5,000	59								
Lower Perak*	26,735	19,800	74												
Dindings	9,873	8,000	81												
	271,065	134,700	50		145,193	86,000	59		97,597	76,900	79		84,588	40,500	48
MALACCA				PENANG & P. WELLESLEY				SINGAPORE				JOHORE KEDAH KELANTAN			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage				
Central	14,093	5,900	42	North	3,549	2,400	69	Singapore	20,115	1,200	6		350,007	91,000	26
Alor Gajah	30,838	19,700	64	Central	10,785	5,600	52						102,126	42,000	42
Jasin	25,286	8,300	33	South	8,936	5,900	66						49,133	7,400	15
				Penang	15,822	800	5						2,916	14,100	43
	70,217	33,900	48		39,092	14,700	38		20,115	1,200	6		29,896		

The percentage of areas out of tapping in March, 1939, was as follows:—Perak 50, Selangor 51, Negri Sembilan 72, Pahang 42, Malacca 50, Penang and Province Wellesley 42, Singapore 3, Johore 20, Kedah 59.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

‡ Estimated from percentage for rest of Malaya.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	June, 1938		March, 1939		June, 1939	
	Acres	Per-centage	Acres	Per-centage	Acres	Per-centage
F.M.S. ...	239,300	39.9	315,500	52.6	338,100	56.4
S.S. ...	43,700	25.3	51,900	40.0	49,800	38.5
U.M.S. ...	147,600	27.6	164,700	30.8	155,400	29.1
Malaya ...	419,600	33.2	532,100	42.0	543,300	43.0

In some localities tapping ceased during April and May owing to padi harvesting and heavy rains and recommenced in the second half of June.

In Kelantan, with the end of the padi harvest tapping was recommenced in many areas, the percentage of holdings out of tapping falling from 41.4 per cent. in March to 15.2 per cent. in June.

Planting.

As the result of advice and propaganda by Departmental officers and Asiatic Rubber Instructors considerably more interest is now being taken in the possibilities of replanting and new planting.

In Selangor, following a tour of the Rural Lecture Caravan, such interest has been particularly in evidence; it is not intended that, once aroused, it should be allowed to flag, and a further series of lectures has been arranged in connexion with the forthcoming mukim council meetings in August.

In Perak South three multiplication nurseries have been established and approximately 940 budded stumps planted. These nurseries will supply budwood to 18 small-holders for the budding of 90 acres of new or replanted rubber. Several other small-holders also wish to establish nurseries.

The Pahang report states that during the quarter there has been a good deal of activity in new planting and replanting. The use of approved planting material was strongly urged, and it is thought that considerable budding will be carried out in 1940. Demonstrations of budding in order to familiarize small-holders with the technique have been given at many centres, and some small-holders have already laid down multiplication nurseries.

The Kelantan report, on the contrary, states that replanting continues to hold no attraction for the small-holder and there has been no response to propaganda on the subject. Similarly with regard to new planting most small-holders appear to have sold their share certificates, and developments in this direction will accordingly be limited.

In Penang and Province Wellesley over 200 small-holders (over 50 per cent. Chinese) are undertaking new planting. Unfortunately some very unsuitable sites have been chosen, and in Province Wellesley a number of Malays have planted on silted-up padi land. In addition to the fact that the soil is so poor that practically nothing will grow, further silting occurs at flood times, and during rains in May the seedlings on a recently planted holding of this type were completely buried by a further deposit of silt from the hills behind.

Pests and Diseases.

Mouldy Rot (*Ceratostomella fimbriata*) was again the most prevalent disease attacking small holdings but control was effected with approved fungicides.

Oidium Heveae was prevalent throughout the Perak South Circle, and in some localities up to 10 per cent. of the trees were affected. In the same report it is stated that during the usual quarterly observations on the spread of root disease it was found that, in six 1 acre lots, there were nine fresh cases of infection.

Giant snails were troublesome on young rubber and cover crops and the use of "Meta" bran mixture was recommended.

Root diseases have been prevalent in Malacca, but, due to the work of Asiatic Rubber Instructors, control measures are now carried out more satisfactorily than formerly.

Oidium Heveae was prevalent in several districts of Johore at the beginning of the quarter but the infection was of a mild nature and the trees soon recovered from the attack.

General.

The practice of selling coupons upon issue and tapping only when additional money is needed appears to be the general procedure among small-holders. One small-holder is said to have described his coupons as "*macham* pension."

There is no tendency to abandon rubber for other crops, but rather the reverse, as there are few other crops which hold equal economic possibilities.

On the other hand, according to the Pahang report there is greater attention being paid to growing foodstuffs in view of the international situation, and all Government officers who have occasion to visit the rural areas have explained the position, and strongly urged steps to ensure a sufficient supply of foodstuffs for self-support. There has been a satisfactory response, and enquiries about growing foodcrops on newly-felled and on cut-out areas have been received.

In one district in Johore a Singapore company has opened an agency for the purchase of latex from small-holders, and it is considered that this method of disposing of their produce is likely to appeal to Malay small-holders.

The Johore report also mentions that small-holders are now planting more padi and foodstuffs than they have done for several years, and in consequence their economic position is gradually improving.

During the quarter several District Rubber Shows were held in various parts of the country in connexion with the All-Malayan Small-Holders' Rubber Competition and the quality of exhibits was very high though the number of entries at certain Shows was disappointing.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.
July, 1939.

The Weather.

The weather has been abnormally hot and dry, even for July. Rainfall recorded at various meteorological stations has been in many cases only a fraction of the small normal amount for this month. It is fortunate that heavy rainfall occurred in June in many parts of the country, so that there have been sufficient supplies of water in most districts to tide over the dry period. Towards the end of the month falls of rain occurred in many places and there were signs that the dry spell was breaking.

Crop Reports.

Rubber.—The extremely hot dry weather is causing a secondary "wintering" in many districts, and the crop has also been very much reduced. Prices have continued to appreciate a little. Rubber without coupons has made a fair gain in price, \$8.50 to \$9 per picul now being quoted. The value of coupons on the other hand has depreciated. This price movement can be attributed to the present reduced crop and also to the effect of the increase in quota for the 2nd and 3rd quarters of the year to 60 per cent.

Small-holders are showing an increasing interest in replanting their holdings. They have taken a long time to realize that, with present market conditions, they can carry out replanting with very little reduction resulting in their income. If the value of coupons should depreciate markedly—as is likely to happen if the quota release is increased greatly—they will unfortunately not be in such a satisfactory position. In Kelantan, where up to the present small-holders have shown little interest in replanting, a number of Malays have now started to replant their holdings. Others will no doubt follow their lead. The Asiatic Rubber Instructors are doing valuable work in arousing interest in replanting and new planting. In Negri Sembilan it is reported that little difficulty is being experienced in persuading small-holders to plant when necessary on contour terraces.

In Klang District the Co-operative Marketing Officer on seven occasions arranged the sale of small-holders' rubber direct with an agency house in Klang. One hundred and sixty-four piculs were sold in this way and the price realized was about \$1.07 per picul above the price offered by the local Chinese dealers.

Padi.—As might be expected the dry weather has held up padi cultivation. In irrigation areas, except on some of the higher land, water supplies were usually adequate. The smaller padi areas, which are mainly dependent on rain for their water supplies, felt the drought worst.

In Malacca the weather has been most unfavourable for padi planting this season. In June there was very little rain, though planters in the inland districts had sufficient water to make a start with cultivation. In July the coastal areas had no water at all and supplies in the inland districts were failing. This year planting in the coastal areas is bound to be very late and the outlook at present is certainly not hopeful.

Fruit.—A fair quantity of fruit is now coming into the markets in most parts of the country, consisting in the main of rambutan, langsat, mangosteen and durians.

There has been an exceptionally heavy crop of fruit this year in North Kedah. Huge quantities of durians were brought into the Weekly Fairs and a large amount was sold to middlemen for export. Rambutan, mangosteen and langsat have also been in season. The Weekly Fairs play an important part in helping to dispose of these heavy crops which would otherwise give rise to severe glutting in the main producing localities.

FERTILIZER PRICES, AUGUST, 1939.

The following are the prices current for the month of August, 1939, of some of the more important fertilizers.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia	20.6	—	—	—	72.75
Calcium Cyanamide	20.6	—	—	—	80.00
Muriate of Potash	—	—	—	50	112.00
Sulphate of Potash	—	—	—	48	112.00
Superphosphate (concentrated)	—	39	—	—	105.00
Superphosphate	—	16-18	—	—	60.00
Basic Slag	—	—	16	—	48.00
Rock Phosphate (Christmas Island)	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	—	11*	26 - 28‡	—	40.00
Lime	—	—	—	—	20.00

* Citric soluble. ‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

DEPARTMENTAL NOTES.

Appointment of Adviser on Agriculture.

Mr. W. N. C. Belgrave, Acting Adviser on Agriculture, has been promoted in the Colonial Agricultural Service to be Director of Agriculture, Straits Settlements, and Adviser on Agriculture, Malay States, with effect from the 1st January, 1939.

Leave.

Mr. R. A. Altson, Plant Pathologist, has been granted 211 days leave from 15th July 1939.

Mr. W. J. B. Johnson, Canning Officer, has been granted 227 days leave from 15th July, 1939. During Mr. Johnson's absence Mr. F. C. Cooke, Chemist, Coconut Products, has proceeded to Johore to take over his duties.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE, 12th JULY, 1939.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 12th July, 1939, under the chairmanship of the Hon'ble the Acting Adviser on Agriculture, Malay States.

Amongst subjects discussed were tea restriction and local China tea manufacture; derris; analysis of rice samples with regard to nutritive value; yields of nuts from young coconut areas; legislation to control the export of planting material. In addition to the foregoing and routine matters the following subjects of importance were dealt with.

Pineapple Industry.

The Chairman reported that, accompanied by the Chief Field Officer, he had recently made a personal inspection of the demonstration factory at Johore Bharu and considered the installation to be highly satisfactory.

Rubber.

The Department now has a total of 11 acres on Agricultural Stations throughout the country planted with budwood nurseries to meet the requirements of small-holders for budwood. The possibility of the purchase of budded stumps for small-holders is being considered by the Rubber Research Institute of Malaya.

Manila Hemp.

The Chairman stated that the Manila hemp machinery at the Central Experiment Station, Serdang, was working satisfactorily. The crop has been planted at various Agricultural Stations throughout the country in order to obtain information regarding yields under various soil conditions.

Statistical.

MARKET PRICES.

July 1939.

Major Crops.

Rubber.—There was little fluctuation in the rubber market during July. No. 1. X. Ribbed Smoked Sheet, loose, opened at 28½ cents per lb., and closed at 28½ cents, the range for the month being from 28 to 28½ cents. The average of daily quotations for the month was 28.27 cents per lb., as compared with 28.53 cents in June. The London average price was 8.27 pence per lb., and New York 16.44 cents gold, as compared with 8.24 pence and 16.31 cents gold in June.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, July, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak		Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.			
	12	19	6	13	20	5	12	19	26
Smoked Sheet ...	35.00	—	35.00	—	35.20	—	34.60	34.81	34.56
Unsmoked Sheet ...	—	34.00	34.00	34.00	34.00	33.46	33.58	34.17	—
Scrap ...	—	—	28.00	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$3.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 5th and 26th July, and at Kuala Pilah on the 27th July.

Palm Oil.—Prices fell heavily, and the month's quotations are given in Table II. The averages of the June quotations were:—palm oil £13.7.6, kernels £8.16.11.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
July 7	£ 12. 15. 0 (nominal)	£ 8. 5. 0 Hamburg
" 14	12. 5. 0 Liverpool	8. 5. 0 "
" 21	12. 5. 0	8. 2. 6
" 28	12. 5. 0 Liverpool	8. 0. 0 Hamburg
Average	£ 12. 7. 6	£ 8. 3. 1

Copra.—The market fell slightly during the month but shewed some improvement at the close. The sun-dried grade opened in Singapore at \$3.75 per picul, fell to \$3.50 on the 21st July, and closed at \$3.60. The Singapore average price for the month was \$3.59 per picul, as compared with \$3.74 in June. The mixed grade averaged \$3.24, as against \$3.41 in June.

Copra cake improved to \$2 per picul in the second half of the month, averaging \$1.76 as compared with \$1.60 in June.

Rice.—The Singapore average wholesale prices of rice per picul in June were as follows:—Siam No. 2 Ordinary \$3.75, Rangoon No. 1 \$3.40, Saigon No. 1 \$3.35, as compared with \$3.81, \$3.22 and \$3.47 in May, and with \$4.25, \$3.95 and \$3.87 in June, 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were:—Singapore 26, Penang 32, Malacca 28, as compared with 27, 32 and 28 respectively in May.

The average declared trade value of imports during June was \$3.68 per picul, as compared with \$3.76 in May and \$3.72 in April.

Padi.—The Government Rice Mills, Perak and Pahang, paid \$2.20 per picul for padi. Retail prices per 100 gantangs (gallons) ranged from \$8 to \$12 in most parts of the country. In Kedah the price was \$7.10 to \$7.50, in Penang and Province Wellesley \$8.70, in Krian \$8, in Kelantan \$9.80, and in Brunei \$10 to \$12. In Perak North the price was \$12, in the Central Circle \$9.69, and in the South Circle \$7 to \$14.

Pineapples.—Prices continued unchanged as controlled by the Central Board of Packers. Per case of 48 cans of 1½ lbs. each they were:—G.A.Q.: Sliced Flat \$3.20, Sliced Tall \$3.35, Cubes \$3.25; Golden: \$3.60, \$3.75 and \$3.65 respectively. Fresh fruit prices per 100 were as follows:—Singapore 50 cents to \$1.80; Selangor \$1 to \$1.10.

Beverages.

Tea.—Two consignments of Malayan highland tea, comprising 130 packages, were sold on the London market during July at 1s. 3d. and 1s. 2½d. per lb. Eight consignments of lowland tea, comprising 546 packages, were sold in London at prices ranging from 11½d. to 1s. 0½d., the average price being 11.94d.

The average London prices per lb. realized for tea from other countries, according to the *Tea Market Reports* for July of the Tea Brokers Association of London, were as follows:— Ceylon 1s.2.15d., Java 1s.0.40d., Indian Northern 1s.2.11d., Indian Southern 1s.0.86d., Sumatra 10.9d.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 25th July, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:— High Grown Teas 79, Medium Grown Teas 72, Low Grown Teas 65.

Coffee.—Liberian coffee was quoted in Singapore throughout the month at \$15 per picul. Excelsa opened at \$10.25, but fell to \$10 in the first half of the month. Robusta opened at \$6.75, fell to \$6.50, but rose again to close at \$6.75.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$8.12 to \$9.12 per picul, and for Sourabaya coffee \$9.81 to \$11.75.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$6.03, Medium \$5.60, Mixed \$5.09.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$3.37 to \$5.50, Red Whole \$3.37 to \$5.50, Sliced \$7.94 to \$10.37, as compared with \$4.48 to \$6.67; \$5.10 to \$6.75; and \$8.76 to \$11.93 in June.

Pepper.—The Singapore market continued unchanged at the June closing prices, which were as follows (per picul):—Singapore Black \$7.25, Singapore White \$11.25, Muntok White \$11.50. The June average prices per picul were \$7.44, \$11.62 and \$11.88 respectively.

Nutmegs.—The market remained unchanged, 110's and 80's both continuing at \$28 per picul. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Siouw continued to be quoted nominally at \$85 per picul, and Amboina fell from \$58 to \$53, averaging \$55 per picul. Locally produced mace, dry, was sold in Penang at \$67 per picul.

Cloves.—Nominal quotations in Singapore remained unchanged at \$40 per picul for both Zanzibar and Amboina. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* for 31st July 1939, from Rs. 1.25 to Rs. 1.34 per lb.

Miscellaneous.

Derris.—There was again no change in Singapore prices of derris, and July quotations per picul were: roots sold on a basis of ether extract \$7.50 to \$9, and on rotenone content \$17.50 to \$18.50.

Gambier.—Singapore prices continued unchanged: Block \$8 per picul nominal, and No. 1 Cube \$17.

Sago.—Prices advanced during the month owing to speculative buying, but fell at the close and stocks in Singapore are heavy. Pearl averaged \$4.09 per picul, and Flour, Sarawak Fair, averaged \$2.49, as compared with \$4.10 and \$2.42 respectively in June.

Tapioca.—Singapore prices per picul were unchanged throughout the month: Flake Fair \$4, Seed Pearl \$4.50, Medium Pearl \$5. The June average prices were \$4.10, \$4.85 and \$5 respectively.

Tobacco.—Prices in Kelantan for prepared tobacco were higher during July: 1st quality \$100 to \$170, 2nd quality \$75 to \$130, 3rd quality \$50 to \$115 per picul. The general range of prices per picul was:—1st quality \$22 to \$28, 2nd quality \$14 to \$20, 3rd quality \$6 to \$14. The range in Kedah was \$40, \$25 and \$17; in Penang and Province Wellesley \$34.50, \$27 and \$20; in Pahang \$13 to \$28, \$10 to \$15, \$5 to \$12. In Malacca prices ranged from \$14.50 to \$16.50.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.— The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

June, 1939.

Malaya.—Imports of foreign rice during June were 74,456 tons,† and exports 13,665 tons. Net imports were accordingly 60,791 tons, as compared with 54,712 tons in 1938.¶

Of the June imports, 51 per cent. were consigned to Singapore, 16 per cent. to Penang, 5 per cent. to Malacca, 21 per cent. to the Federated Malay States, and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 48,965 (65.8), Burma 20,596 (27.6), French Indo-China 3,699 (5.0), other countries 1,196 (1.6).

Of the exports during June, 69 per cent. were consigned to the Netherlands Indies and 31 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 11,027 (80.7), Burma 2,351 (17.2), French Indo-China 211 (1.5), parboiled 51 (0.4), Malayan production 25 (0.2).

June net imports by countries of origin were (in tons, percentages in brackets):—Siam 37,938 (62.4), Burma 18,245 (30.0), French Indo-China 3,488 (5.7), elsewhere 1,120 (1.9).

India.—Foreign exports during January to May were 130,000 tons, as compared with 119,000 tons in 1938, an increase of 9.2 per cent. Of these exports 8.8 (4.2) per cent. were to the United Kingdom, 2.3 (6.7) per cent. to the Continent of Europe, 30.8 (35.3) per cent. to Ceylon, 3.9 (5.1) per cent. to the Straits Settlements and the Far East, and 59.2 (48.7) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Burma.—Foreign exports from the 1st January to 21st June totalled 2,285,102 tons, as compared with 1,928,423 in 1938, an increase of 18.5 per cent. Of these exports 56.7 (42.5) per cent. were to India, 7.0 (9.1) per cent. to the United Kingdom, 8.4 (8.0) per cent. to the Continent of Europe, 8.4 (10.5) per cent. to Ceylon, 9.0 (13.7) per cent. to the Straits Settlements and the Far East, and 10.5 (16.2) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average June prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 224, Small Mills Specials 228.

Siam.—Exports of rice and rice products from Bangkok during January to April were 610,925 tons, as compared with 565,521 tons in 1938.

* Abridged from the Rice Summary for June 1939 compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

Japan.—According to a report dated 29th June 1939, relating to the official estimate of the first Formosan rice crop, the area under rice shows a sharp decrease, the figures for the last three years being as follows:—

1937	...	...	729,239 acres
1938	...	...	713,491 „
1939	...	...	660,088 „ (estimate).

Favourable weather at the time of planting was followed by an unduly cold winter, and an excessively wet and sunless spring, which encouraged insect pests. The rains were particularly heavy during the first three weeks of June, and a good deal of rice land in the southern prefectures was flooded. The combination of adverse weather and reduced acreage is expected to produce the smallest rice crop for many years.

The following is the estimated production for the first crop of 1939, actual figures for the same crop of the previous two years being shown for purposes of comparison:

		1939	1938	1937
		tons	tons	tons
“Horai” rice	...	358,761	409,836	390,636
Formosan rice (wet)	...	228,031	229,202	211,489
„ „ (dry)	...	9,157	13,028	16,586
TOTAL	...	595,949	652,066	618,711

The above reduction in acreage has been in accordance with the rice policy which the Government General of Formosa has now followed for many years, of increasing the yield per acre, while reducing acreage, and giving the acreage saved to sugar and other special crops which cannot be grown in most other parts of the Japanese Empire.

But already four months ago the central authorities in Tokyo, taking alarm over a possible rice shortage, declared that the Formosan rice restriction policy was to be abandoned, and that production in the 1940 “rice year” (*i.e.* the second crop of 1939 and the first of 1940) was to be increased by 70,126 tons. It is singularly unfortunate for the Formosan authorities, whose policy was already in disfavour, that the first crop of 1939 should now show a decrease of nearly 56,518 tons; and one may surmise that the ill-luck of this exceptionally bad season coinciding with an exceptionally large reduction of acreage will make the central authorities still less inclined to listen to their pleas on behalf of sugar and other special crops.

It is evident that the new orders must at the best have produced considerable dislocation. The average yield per acre for the two crops has in recent years been about 1 ton, which will mean that about 40,000 additional acres will have to be put back to rice for each crop to meet the desired increase. Since much of the land is not two-crop land, the actual acreage required will probably in fact exceed this figure.

French Indo-China.—Entries of padi into Cholon during the first six months of 1939 totalled 1,107,312 tons, as compared with 697,014 tons in 1938, an increase of 58.9 per cent. Exports of rice during the same period were 1,034,820 tons, as compared with 694,620 tons in 1938, an increase of 49.0 per cent.

The price of rice in the Saigon market rose in May from \$2.93 to \$3.03 per picul, but fell to \$2.91 at the close. Padi prices remained stable, rising from \$1.90 to \$1.97, and closing at \$1.91.

The Netherlands Indies.—The latest information available was published in the March Summary.

Ceylon.—Imports during the first half of 1939 totalled 298,608 tons, as compared with 279,364 tons in 1938, an increase of 6.9 per cent. Of these imports 15.2 (17.3) per cent. were from British India, 62.8 (71.5) per cent. from Burma, 0.3 (0.3) per cent. from the Straits Settlements, and 21.7 (10.9) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 14th June totalled 855,088 tons, as compared with 734,449 tons in 1938, an increase of 16.4 per cent. Of these shipments 37.9 (46.5) per cent. were from Burma, 48.6 (43.1) per cent. from Saigon, 12.6 (8.6) per cent. from Siam, and 0.9 (1.8) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments for the Levant from 1st January to 10th June totalled 13,228 tons, as compared with 22,305 tons in 1938, a decrease of 40.7 per cent. Shipments for Cuba, West Indies and America from 1st January to 5th June were 105,562 tons, as compared with 88,828 tons in 1938, an increase of 18.8 per cent.

MALAYAN AGRICULTURAL EXPORTS, MAY, 1939.

PRODUCT.	Net Exports in Tons				
	Year 1938	Jan./May 1938	Jan./May 1939	May 1938	May 1939
Arecanuts ...	33,769	17,743	15,881	3,766	1,499
Coconuts fresh†† ...	116,743†	36,414†	39,755†	6,231†	5,301†
Coconut oil† ...	49,140	17,585	23,370	3,069	5,850
Copra† ...	68,754	14,987	9,614	2,545	2,867
Copra cake ...	7,112	612	3,053	103	876
Gambier, all kinds ...	1,632	2,386	760	298	177
Palm kernels ...	9,359	3,592	4,387	807	1,018
Palm oil ...	54,377	20,599	18,438	4,084	2,458
Pineapples, canned ...	73,168	33,689	38,487	6,781	10,224
Rubber¶ ...	360,898¶	165,449¶	131,478¶	29,481¶	25,021¶
Sago,—flour ...	4,537	2,219	3,128	87	506
„ —pearl ...	4,203	1,699	1,547	324	364
„ —raw ...	5,088*	2,767*	1,940*	435*	448*
Tapioca,—flake ...	981	126*	454	446*	119
„ —flour ...	3,072*	1,368*	1,352*	106*	265*
„ —pearl ...	17,818	6,708	6,961	1,476	1,776
Derris (tuba root) ...	676	165	580	34	150
† Copra equivalent ...	150,944	28,575	48,385	4,987	12,484

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS
(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
Total ...	13,480.3	12,616.9	26,097.2	2,435.9	2,116.1	4,552.0
Total January to June, 1938 ...	11,870.6	8,993.9	20,864.5	2,145.2	1,560.0	3,705.2
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 30th June, 1939, were: palm oil 6,731 tons, palm kernels 528 tons.

MALAYAN RUBBER STATISTICS
ACREAGES OF TAPPELLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH JUNE, 1939.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (9)+(11) (2)	ACREAGES OF TAPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3)+(5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acreage (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	42,994	1,024	2.4	15,255	35.5	473	1.1	16,279	37.9	26,715	62.1	7,746	18.0
Malacca ...	119,397	5,609	4.7	37,407	31.3	2,176	1.8	43,016	36.0	76,381	64.0	24,289	20.3
Penang ...	2,505	nil	nil	1,250	49.9	35	1.4	1,250	49.9	1,255	50.1	60	2.4
Singapore ...	31,953	5,306	16.6	10,244	32.1	175	0.5	15,550	48.7	16,403	51.3	3,331	10.4
Total S.S. ...	196,849	11,939	6.1	64,156	32.6	2,859	1.5	76,095	38.7	120,754	61.3	35,426	18.0
F. M. S.—													
Perak ...	284,546	11,205	3.9	74,957	26.4	7,891	2.8	86,162	30.3	198,384	69.7	49,444	17.4
Selangor ...	317,006	11,898	3.8	74,200	23.4	7,175	2.3	86,098	27.2	230,908	72.8	52,967	16.7
Negri Sembilan ...	262,732	13,029	5.0	79,848	30.4	13,042	5.0	92,877	35.4	169,855	64.6	39,753	15.1
Pahang ...	85,718	4,935	5.8	27,767	32.4	5,724	6.7	32,702	38.2	53,016	61.8	10,061	11.7
Total F.M.S. ...	950,002	41,067	4.3	256,772	27.1	33,832	3.6	297,839	31.4	652,163	68.6	152,225	16.0
U. M. S.—													
Johore ...	480,199	25,554	5.3	142,056	29.6	38,244	8.0	167,610	34.9	312,589	65.1	67,511	14.1
Kedah ...	199,193	10,331	5.2	33,677	16.9	6,581	3.3	44,008	22.1	155,185	77.9	44,189	22.2
Kelantan ...	31,204	403	1.3	7,422	23.8	2,398	7.7	7,825	25.1	23,379	74.9	5,569	17.8
Trengganu (d) ...	4,817	nil	nil	42	0.9	nil	nil	42	0.9	4,775	99.1	2,135	44.3
Perlis (e) ...	1,459	380	26.0	341	23.4	155	10.6	721	49.4	738	50.6	394	27.0
Brunei ...	5,913	nil	nil	2,218	37.5	316	5.3	2,218	37.5	3,695	62.5	1,216	20.6
Total U.M.S. ...	722,785	36,668	5.1	185,756	25.7	47,094	6.6	222,424	30.8	500,361	69.2	121,014	16.7
Total MALAYA ...	1,869,636	89,674	4.8	506,684	27.1	84,385	4.5	596,358	31.9	1,273,278	68.1	308,665	16.5

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th June, 1939.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF JUNE, 1939, IN DRY TONS.

FOR THE MONTH OF JUNE, 1939, IN DRY YEARS.

State or Territory	Stocks at beginning of month 1		Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports during the month		Exports including re-exports				Stocks at end of month		Consumption 3						
									January to June 1939		during the month										
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1939	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to June 1939			
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	99
Federated Malay States	...	4,200	25,187	9,757	56,302	1,219	20,604	Nil	Nil	Nil	Nil	9,062	359	64,643	19,873	...	3,792	27,200	20	...	99
Johore	...	1,651	9,643	4,261	25,197	1,119	14,041	Nil	68	Nil	270	2,017	2,663	14,891	24,908	...	1,482	10,480	...	...	...
Kedah	...	169	5,408	2,491	13,872	206	3,625	Nil	Nil	Nil	Nil	1,247	1,164	8,232	9,440	...	110	5,753	...	...	...
Perlis	...	12	24	14	6	105	6	Nil	Nil	Nil	Nil	Nil	23	Nil	164	...	3	781	...	...	...
Kelantan	...	*465	500	345	1,773	448	2,813	Nil	Nil	Nil	Nil	147	395	1,660	2,858	...	435	781	...	...	...
Trengganu	...	18	337	134	766	38	1,107	Nil	Nil	Nil	Nil	Nil	127	Nil	420	...	Nil	420	...	...	...
Brunei	...	8	78	42	206	35	317	...	...	...	...	...	78	...	80	...	Nil	80	...	...	...
Total Malay States	...	6,523	41,172	17,044	98,165	3,091	42,616	Nil	68	Nil	270	12,473	4,909	89,296	52,579	...	5,752	44,744	20	...	99
S. SETTLEMENTS:—
Malacca	...	1,233	2,245	927	5,413	353	2,668	Nil	Nil	Nil	Nil	1,643	...	12,473	2,444	...	1,124	2,444	...	...	...
Province Wellesley	...	516	853	394	2,026	137	830	Nil	...	...	...	...	...	31,891	503	...	503	994	...	...	...
Penang	...	1,366	2,302	13	90	70	358	1,577	6,690	13,704	54,252	3,678	Nil	113,738	800	...	2,516	19	...	...	160
Singapore	...	4,936	12,270	263	113	602	59	262	7,955	66,233	296	13,647	Nil	Nil	4,740	...	11,529	249	...	25	...
Labuan	...	19	Nil	Nil	Nil	4	50	35	...	...	...	Nil	Nil	Nil	...	...	12	Nil	...	...	...
Total Straits Settlements	...	6,302	16,340	3,374	1,450	8,131	623	4,177	6,690	83,233	54,252	19,068	Nil	157,792	5,540	...	15,684	3,699	...	25	160
Total Malaya	...	6,302	92,863	44,546	18,494	16,296	3,714	46,793	6,758	83,233	54,522	31,541	4,909	247,688	5,540	...	21,436	48,443	45	...	259

* Figures amended.

*Figures amended.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S. Penang	Province Wellesley	Johore	Kedah
	23	24	25	26	27
DRY RUBBER	3,249	11,312	2,432	1,292	1,255
WET RUBBER	473	217	84	247	227
TOTAL	3,722	11,529	2,516	1,639	1,482

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to June
	29	31
Singapore	...	171,548
Penang	...	6,325
Port Swettenham	...	51,181
Malacca	...	23,729
MALAYA	...	630

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to June
	33	1939
Malay States	...	14,541
Straits Settlements	...	17,282
MALAYA	...	18,938

- Notes:—**
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production imports + Stocks at beginning of month = Exports + Stocks at end of month + Consumption, i.e., Column [7] = Columns [13] + [14] + [15] + [16] + [17] + [18] + [19] + [20] + [21] + [22] + [23] + [24] + [25] + [26] + [27] + [28] + [29] + [30] + [31] + [32] + [33] + [34] + [35] + [36] + [37] + [38] + [39] + [40] + [41] + [42] + [43] + [44] + [45] + [46] + [47] + [48] + [49] + [50] + [51] + [52] + [53] + [54] + [55] + [56] + [57] + [58] + [59] + [60] + [61] + [62] + [63] + [64] + [65] + [66] + [67] + [68] + [69] + [70] + [71] + [72] + [73] + [74] + [75] + [76] + [77] + [78] + [79] + [80] + [81] + [82] + [83] + [84] + [85] + [86] + [87] + [88] + [89] + [90] + [91] + [92] + [93] + [94] + [95] + [96] + [97] + [98] + [99] + [100]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (32) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 27th July, 1939.

METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1939.

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LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT				EARTH TEMPERATURE		RAINFALL							BRIGHT SUNSHINE.					
	Means of		Absolute Extremes		At 1 foot	At 4 feet	Total		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.			
	A.	B.	Min.	Max.			Lowest.	Lowest.		Thunder-storm.	Fog morning obs.	Gale force 8 or more							
	°F	°F	°F	°F	°F	°F	in.	mm.	in.	Precipitation, .01 in or more	Precipitation, .04 in or more	Thunder-storm.	Fog morning obs.	Gale force 8 or more	hrs.	hrs.			
	°F	°F	°F	°F	°F	°F	in.	mm.	in.	Amt.	Amt.								
Railway Hill, Kuala Lumpur, Selangor	90.3	72.4	81.3	94	69	81	75	84.3	85.2	5.05	128.3	1.07	16	7	1	1	188.05	6.27	51
Bukit Jeram, Selangor	88.9	73.0	80.9	92	71	79	76	85.3	87.4	5.81	147.6	2.17	8	—	1	1	219.20	7.31	59
Sitiawan, Perak	89.8	73.1	81.5	93	70	80	75	84.6	85.1	4.12	104.6	1.23	11	9	1	—	198.70	6.62	54
Ipoli Aerodrome, Perak	90.7	72.4	81.5	94	69	80	75	84.1	84.9	4.74	120.4	1.79	14	11	3	—	190.75	6.36	51
Temerloh, Pahang	89.4	72.7	81.1	95	70	81	76	85.3	86.7	12.16	308.9	2.20	16	13	6	7	162.35	5.41	44
Kuala Lipis, Pahang	88.6	71.7	80.1	92	69	79	75	84.1	85.0	10.23	259.8	1.82	18	17	9	27	158.20	5.27	43
Kuala Pahang, Pahang	86.5	73.9	80.2	91	71	78	77	85.3	86.8	5.32	135.1	1.41	15	14	—	2	193.85	6.46	53
Kallang Aerodrome, Spore	85.8	76.3	81.1	89	72	78	82	83.1	84.3	5.67	144.0	2.19	15	13	4	1	173.75	5.79	47
Bayan Lepas Aerodrome Penang	87.3	74.2	80.7	90	72	78	77	84.7	85.3	9.72	246.9	2.73	19	17	—	—	183.30	6.11	49
Malacca Town, Malacca	85.7	74.1	79.9	90	70	80	77	84.5	85.4	6.88	174.8	2.14	13	10	7	3	204.10	6.80	55
Kluang, Johore	88.2	71.3	79.7	94	69	79	73	82.1	83.0	9.10	231.1	3.35	15	12	6	13	166.35	5.55	45
Mersing, Johore	87.0	71.9	79.5	90	70	79	75	82.9	83.1	2.83	71.9	0.84	13	11	3	—	201.60	6.72	55
Alor Star, Kedah	87.5	74.6	81.1	90	72	79	77	85.1	85.8	10.96	278.4	6.32	17	13	—	1	190.75	6.36	51
Kota Bahru, Kelantan	89.4	73.9	81.7	92	71	79	78	85.7	85.6	10.40	264.2	1.92	16	14	1	—	221.05	7.37	59
Kuala Trengganu, Trengganu	88.0	73.2	80.6	90	70	77	76	83.7	85.3	4.53	115.1	0.94	12	9	5	1	210.75	7.03	57
Labuan	87.3	76.9	82.1	90	73	84	80	85.2	86.8	13.88	352.6	4.31	13	11	1	—	238.25	7.94	64
HILL STATIONS.																			
Fraser's Hill, Pahang 4268 ft.	74.8	63.0	68.9	78	59	67	65	72.1	72.2	3.47	88.1	1.69	15	11	1	7	159.35	5.31	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	72.9	56.9	64.9	77	51	68	63	70.1	69.7	7.73	196.3	2.22	21	18	3	2	154.95	5.17	42
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	73.1	59.6	66.3	78	57	68	63	*	*	7.90	200.7	2.48	20	18	—	—	163.25	5.44	44

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE Malayan Agricultural Journal.

SEPTEMBER, 1939

EDITORIAL.

Sir Frank Stockdale's Report.

We publish in this number a slightly augmented summary of the conclusions reached by Sir Frank Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies, as a result of his visit to study Malayan agriculture.

Sir Frank Stockdale has travelled extensively on similar tours in other parts of the Colonial Empire and his five weeks stay in this country enabled him to give Malaya the benefit of his extensive knowledge of tropical agriculture.

The summary in this number is self explanatory but it may be remarked here that the main theme running through the report itself is that of the general poverty of local soils. Sir Frank Stockdale apparently feels that the chief conclusions arising out of his visit to Malaya are that the future activities of the Department of Agriculture should largely be devoted to the problems of maintenance and improvement of soil fertility; to the establishment of tree or orchard crops as distinct from annuals, and to the development of fruit cultivation in the *kampung*, the latter with the dual purposes of improving rural nutrition and of facilitating rural monetary exchange.

It is hoped in a future number to publish an account of Sir Frank's conclusions as a result of his visit to the Netherlands Indies and to Ceylon.

The Feeding of Pigs.

It has been pointed out previously in this Journal that there are some 700,000 pigs in Malaya and that the annual import of swine to supplement local production is about 150,000. During normal times the value of such imports amounts to about 2 million dollars, and there can be little doubt as to the desirability of making this country more self-supporting in this respect.

An improved local pig population can be secured by better feeding, better breeding, or best by a combination of the two. With regard to breeding it can be and has been demonstrated very successfully that crosses between selected pure-bred boars and the ordinary local Chinese-type sow result in upgraded progeny that are markedly superior to their dams. This improvement is of particular value in that it can be secured at comparatively little cost. An article in this number confirms

this fact and also shows that, under ordinary conditions of market price, balanced rations fed to such upgraded pigs are more profitable than the rations fed on a typical Chinese small holding.

The balanced rations described possess two additional virtues. Firstly, almost all of their constituents are either grown or produced locally, and secondly, the majority of these constituents are of little direct use as human food. The importance of the latter point lies in the fact that in any livestock the conversion of food into meat entails an unavoidable wastage of the total nutrients fed. In times of emergency, such as the present, when the provision of food for the human population requires careful consideration, it is therefore highly problematical if any foodstuff should be fed in appreciable quantities to livestock if it can be utilized directly and hence more efficiently as human food.

The Sixteenth Malayan Exhibition.

The Sixteenth Malayan Exhibition, which was held at Kuala Lumpur on the 5th, 6th and 7th August this year, was opened by His Excellency the High Commissioner, Sir Shenton Thomas, G.C.M.G., O.B.E., and was in many respects more comprehensive than in previous years. The general lay-out and staging of many of the exhibits benefited to a marked extent by the provision of new permanent buildings which have largely been made possible by a handsome financial grant from the Federated Malay States Government.

Consonant with the troubled international situation, the speeches at the opening ceremony of His Excellency the High Commissioner and of Dato F. W. Douglas, the President of the Malayan Agri-Horticultural Association, made a major feature of local padi production in its relationship to the Malayan food supply. An article in this number describing the Exhibition quotes His Excellency's speech in full, and the latter was noteworthy as containing a suggestion that in view of the emergency situation the time had arrived for a consideration of the feasibility of extending padi cultivation in this country to all races of Asiatics domiciled here.

The sectional organization of the Exhibition followed that of recent years. The State village industries stalls undoubtedly constituted the chief attraction, that of Kelantan being particularly noteworthy, and these stalls all gained greatly by being housed in the largest of the new buildings. All sections, however, were very well patronized and it is a fitting tribute to those responsible both for the Exhibition as a whole and for the individual exhibits that the attendance figure was the highest recorded in recent years.

Original Articles.

A FEEDING TRIAL WITH HALF-BRED PIGS IN PENANG

BY

C. W. S. HARTLEY,

Agricultural Officer, Province Wellesley and Penang.

Introductory.

Recent experiments at the Stock Farm, Central Experiment Station, Serdang, have shown that certain balanced rations, designated as rations A. 1 and A. 2, give satisfactory live-weight gains with Middle White pigs⁽¹⁾, and that pure bred Chinese pigs fed on these rations show a marked increase in their rate of live-weight gain when compared with those fed under Chinese small-holding management in Selangor⁽²⁾.

An opportunity was presented in October 1938 of comparing the growth of half-bred pigs fed with rations A. 1 and A. 2 with the growth of half-bred pigs fed under Chinese management in Penang.

A Chinese sow mated with a Middle White boar farrowed a litter of 14 half-breds at the Ayer Itam Agricultural Station, Penang, on August 23rd. When weaned at 8 weeks old, two groups of 6 pigs each were matched, the average weight of each group being 14.4 lbs. One group was handed over to a Chinese pig rearer who fed what may be described as an "average ration" used by the Chinese in Penang, while the other group was retained at Ayer Itam and fed on rations A. 1 and A. 2. Both groups of pigs were weighed and sold to the butcher at 7½ months old.

Details of Rations.

Tables showing the quantity of each ingredient in rations A. 1 and A. 2, together with the amount of digestible nutrients each contains, were given in the *Malayan Agricultural Journal* for September 1938⁽²⁾. The only differences between these rations and those used in the Penang experiment are that good quality once-pressed coconut cake was used instead of twice-pressed cake and groundnut cake was substituted for soya bean cake, which is now unobtainable in Penang.

Table I shows the total rations fed to the six pigs at Ayer Itam Agricultural Station together with the costs.

The total ration fed by the Chinese small-holder to his six pigs is given with costs, in Table II.

This ration is not so primitive as that used by the Selangor Chinese described in the article referred to above⁽²⁾, and it would appear that the Chinese pig-rearers in Penang normally maintain a higher standard of feeding than those in Selangor.

Table I.

Rations and Costs at Ayer Itam Agricultural Station.

Food	Quantity Fed	Proportion of Total Concentrates	Price of Concentrates per picul	Cost of Concentrates	
				Total	Per Pig
	lbs.	per cent.	\$	\$	\$
1. Broken rice ...	572	23.2	2.43	10.47	1.75
2. Rice polishings ...	433	17.5	2.07	6.75	1.12
3. Coconut cake (once-pressed)	483	19.6	2.72	9.89	1.65
4. Groundnut cake ...	874	35.4	2.79	18.36	3.06
5. <i>Hampas</i> * and tapioca roots ...	3,333				
6. Guinea grass ...	224				
7. Red palm oil ...	67	2.7	20.00	10.05	1.68
8. Minerals ...	40	1.6	16.00	2.68	.45
Total concentrates (1, 2, 3, 4, 7 & 8).	2,469	100.0		58.20	9.71
Total bulk foods (5 & 6)	3,557				
Total ...	6,026				

* *Hampas*, or tapioca refuse, is the residue remaining after the extraction of starch from the tapioca roots.

Comparison of Rations.

It has been thought desirable to assess only the costs of those ingredients which would actually be bought by a Penang rearer, these ingredients being the concentrates in the ration. The bulky foods are left out of account as they are grown by the small-holder himself. From Tables I and II it will be seen that the total quantity of concentrates fed is approximately the same in each ration. In Table III the proportions and costs of the concentrates fed to the two groups of pigs are compared.

Table II.

Ration and Costs on Chinese Holding.

Food	Quantity Fed	Proportion of Total Concentrates	Price of Concentrates per picul	Cost of Concentrates	
				Total	Per Pig
	lbs.	per cent.	\$	\$	\$
1. Red rice ...	400	17.1	3.00	9.00	1.50
2. Rice polishings ...	520	22.3	2.07	8.10	1.35
3. Coconut cake (twice-pressed)	1,013	43.5	2.10	16.00	2.67
4. Fish (fresh) ...	400	17.1	1.00	3.00	.50
5. Banana stems, <i>hampas</i> and vegetable leaves ...	5,130				
Total concentrates (1, 2, 3 & 4)	2,333	100.0		36.10	6.02
Total bulk foods (5)	5,130				
Total ...	7,463				

Table III.

Comparison of Proportions and Costs of Concentrates in Rations.

Details of Concentrates	Proportions of Total Concentrates		Costs per Pig	
	A.1 and A.2	Chinese Holding	A.1 and A.2	Chinese Holding
	per cent.	per cent.	\$	\$
1. Broken rice (A.1 & A.2) or red rice (C.H.)* ...	23.2	17.1	1.75	1.50
2. Rice polishings ...	17.5	22.3	1.12	1.35
3. Coconut cake (once-pressed, A.1 & A.2, twice-pressed C.H.)	19.6	43.5	1.65	2.67
4. Groundnut cake (A.1 & A.2) or fish (C.H.) ...	35.4	17.1	3.06	.50
5. Red palm oil ...	2.7		1.68	
6. Minerals ...	1.6		.45	
Total ...	100.0	100.0	9.71	6.02

* C.H. refers to the ration fed on the Chinese holding.

It will be seen that the total quantity of rice foods in the two rations is approximately the same. The proportion of rice polishings is slightly lower in the A. 1 and A. 2 rations, and red or cargo rice contains more protein than broken rice. The rice foods in the Chinese ration therefore contain a slightly larger quantity of protein.

The outstanding differences occur in the protein foods. The Chinese ration contains a large quantity of twice-pressed coconut cake and a small quantity of fish, whereas the A. 1 and A. 2 rations with 35 per cent. groundnut cake, have a much higher percentage of protein. The main differences between the rations, therefore, are (a) rations A. 1 and A. 2 contain more valuable protein concentrates, (b) rations A. 1 and A. 2 contain red palm oil and added minerals.

Examination of the costs of the two rations shows that rations A. 1 and A. 2 cost 61 per cent. more than the Chinese ration and that this is mainly due to the high cost of groundnut cake and red palm oil. It should be mentioned here, however, that the cost of red palm oil was high in this experiment as it was bought in small tins from Serdang. A pig keeper in Penang normally using palm oil for his pigs would be able to obtain it in larger quantities for just over half the price. The cost per pig in rations A. 1 and A. 2 would then have been reduced to about \$9.

The Results of the Trial.

The individual weights of pigs and live-weight gains are set out in Table IV. It will be seen that in spite of the small number of pigs the difference in live-weight gain is easily significant. Table V shows costs of rations per lb. live-weight gain and profit obtainable at different price levels.

Table IV.
Details of Individual Weights of Pigs and Live-Weight Gains.

Pig	Ayer Itam Agricultural Station				Chinese Holding		
	Date of Weighing			Live-Weight Gain	Date of Weighing		Live-Weight Gain
	(Weaning) Oct. 17	Jan. 18	Apr. 6		(Weaning) Oct. 17	Apr. 6	
1	lbs. 14.0	lbs. 82.6	lbs. 173.3	lbs. 159.3	lbs. 12.7	lbs. 97.3	lbs. 84.6
2	12.0	76.0	138.6	126.6	13.3	106.6	93.3
3	12.7	77.3	161.3	148.6	12.7	114.6	101.9
4	15.3	80.0	160.0	144.7	14.7	114.6	99.9
5	16.7	75.3	168.0	151.3	17.3	136.0	118.7
6	16.0	74.6	166.6	150.6	16.0	121.3	105.3
Mean	14.4	77.6	161.3	146.9	14.4	115.0	100.6

Mean significant difference between live-weight gains ($P = 0.01$) = 20.8 lbs.

Table V.
Results of Trial of Cross-Bred Pigs fed at Ayer Itam Agricultural Station and on a Chinese Holding.

	Ayer Itam Rations A.1 & A.2	Chinese Holding Rations
Average weight at 8 weeks ...	lbs. 1.44	lbs. 14.4
" 21 " ...	77.6	—
" 32 " ...	161.3	115.0
Live-weight gained in 24 weeks ...	146.9	100.6
" " per day ...	.86	.59
Total weight of concentrates fed per pig	412.0	389.0
	cents	cents
Cost of concentrates per lb. ...	2.36	1.55
Cost of concentrates per lb. live-weight gain ...	6.61	5.98
	\$	\$
With price at \$10 per picul live-weight, excess over cost of food is:— ...	2.37	2.59
At \$12 -do- ...	4.79	4.32
At \$15 -do- ...	8.42	6.91
At \$20 -do- ...	14.46	11.22

Discussion.

The pigs fed on rations A. 1 and A. 2 made much better live-weight gains than the Chinese pigs on the same rations at Serdang⁽²⁾, thus showing the value of the cross-bred, but they did not make quite such good gains as the Middle Whites at Serdang⁽¹⁾. Comparatively good live-weight gains were made, however, by the cross-bred pigs on the Chinese ration, the actual gain per day being higher than that of the Chinese pigs fed on rations A. 1 and A. 2 at Serdang. This is a further indication of the superiority of the cross-bred over the Chinese pig.

It will be seen from Table V that, whereas at the low prices which obtained in Penang during April 1939 (\$10 to \$12 per picul) little or no extra profit was made by feeding rations A. 1 and A. 2, at higher or more normal prices these rations, which produce higher live-weight gains and therefore more weight of pig to sell, produce a greater profit than is obtained from the Chinese ration. It must be concluded, therefore, that, provided prices are not at an abnormally low level, the balanced rations are more profitable to use than local rations.

With regard to quality, although the pork from the pigs fed on balanced rations was of a firmer texture, a premium is not obtainable for this in Penang. In Selangor, on the other hand, where the pork eating population is largely composed of mining labourers, a premium for the fatter type of pig produced by the balanced rations can be obtained.

It is worth noting that in the Chinese ration a quantity of fish was fed. This fish cost only \$1 per picul and must be regarded as a very cheap source of protein and minerals in the ration. It is thought, therefore, that the effect of the introduction of a proportion of fish into the balanced ration will be a fruitful line of investigation for the future.

Acknowledgments.

Acknowledgment is made to Mr. J. R. P. Soper who commenced the trials and to Mr. Tan Ah King who supervised the work.

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Received for publication 28th June, 1939.

THE SIXTEENTH MALAYAN EXHIBITION

BY

H. L. BARNETT,

Assistant to Agricultural Economist.

The Malayan Agri-Horticultural Association is to be congratulated on the success of this year's Malayan Exhibition, which was held as usual in Kuala Lumpur during the August Bank Holidays, the 5th, 6th and 7th August, 1939.

Largely owing to the provision of additional permanent buildings, made possible by a special grant of \$10,000 by the Federated Malay States Government, the general lay-out of the Exhibition was considerably improved and the increased crowds of visitors more satisfactorily accommodated. In particular, State village industry stalls benefited by being allocated the largest of the new buildings, and they constituted the principal attraction of the Exhibition.

The Association is fortunate in having this year as their Secretary, Mr. G. Shelton-Palmer, to whom much of the credit for the success of the Exhibition should go.

The long period of drought commenced to break during the Exhibition, but fortunately rains were not severe and did not affect attendances, which were the highest recorded for several years. The official figures show a total attendance of 48,542, of which 36,325 paid for admission and 12,217 were admitted on members' and free passes. In 1938 the total attendance was 46,679, and 35,378 in 1937.

Opening Ceremony.

The Exhibition was opened by His Excellency the Governor and High Commissioner, Sir Shenton Thomas, G.C.M.G., O.B.E., in the presence of a distinguished gathering which included Lady Thomas, His Highness the Sultan of Selangor, His Highness the Sultan of Pahang, His Highness the Raja Muda of Perak, the British Resident, Selangor, the British Resident, Pahang, and the Federal Secretary.

In asking His Excellency to open the Exhibition Dato F. W. Douglas, President of the Association, claimed that the Exhibition provided the only opportunity for a view to be obtained of life in Malaya from the many angles normally not available in everyday life. Discussing the rice crop of Malaya and making a comparison with Java, he pointed out that production of rice had increased by 27 per cent. and the area planted by 12 per cent., but that it could not be considered a money-yielding crop. He suggested that the problem is to ensure that the producer obtains such a price for his padi that he will prefer growing it to other forms of cultivation or employment, and urged the provision of water supply to padi areas at present dependent on the vagaries of the weather.

His Excellency's speech was as follows:—

" Once again it is my pleasant duty to open the Annual Exhibition of the Malayan Agri-Horticultural Association; once again I have to record that the Exhibition of this year—the sixteenth of its kind—is larger and better in the number and variety of exhibits than it has ever been before. For this encouragement our

thanks are due, first, to the organizers who by their enthusiasm and ability have proved that an exhibition of this sort is well worth while; secondly to the exhibitors who have so readily accepted the opportunity to display what they make and what they sell; and thirdly, to the F.M.S. Government which, like a fairy god-mother, has once more yielded to the importunity of your President and has provided funds which have been used to erect a permanent building for the exhibits of arts and crafts from the various States. And, now that I have mentioned your President, I think that a very special word of thanks is due to Mr. F. W. Douglas, who has been President of the Association since it was started in 1923 and to whose never failing interest and help all of us who are here to-day and will be here during the next few days owe so much. He may well be pleased with the fruit of his labours.

One of the most satisfactory features of this Exhibition is the Trade Section, where every inch of space has been taken up. This, to my mind, is practical proof of the value of this Exhibition to the trade and commerce of Malaya. It speaks well, also, for the enterprise of commercial firms, who realize that to sell goods they must advertise them and that it is a wise policy to maintain their activities in lean years so that they may be able to reap the best advantage of the fat years which will surely come.

Once again the Sultan of Selangor has taken up space at his own expense, but this year instead of one stall only, His Highness is represented by two. There you will be able to see, and to buy, products of the villages of the State of Selangor, and in offering to the Sultan my hearty congratulations on the success of last year's venture I add the hope that this year it may be even greater.

Whereas last year five States were represented in the Arts and Crafts Section, this year there are nine, and there is the usual attractive exhibit from the Sultan Idris Training College at Tanjong Malim where we can buy, among other things, our yearly supply of baskets. Added interest is given to the Arts and Crafts Section by the presence of a number of craftsmen. There are weavers in silk from Pekan, Kota Bharu, Klang, and Tanjong Malim: there are weavers in fibre from Negri Sembilan, Malacca, and Perak. There are potters from Kedah, silversmiths from Kedah, Kelantan, and Brunei, ropemakers and top makers from Malacca. It is clear that this Exhibition has taken a strong hold on the imagination of the people.

I wish now to turn for a moment to the subject of food production about which your President has just spoken and which has been engaging the earnest attention of my advisers and myself for many months past. There is no need for me to stress the importance of this matter. The chief article of diet for the mass of the population of Malaya is rice, and the cold-fact is that for every ton of rice produced in this country two tons have got to be imported. Much has been done since my predecessor started his campaign for local rice production, and since the formation of the Drainage and Irrigation Department in 1932, irrigation facilities have been improved on 123,000 acres of land, and irrigation has been provided on a further 42,500 acres. This good work continues.

Mr. Douglas has compared us with Java, but there are two good reasons why this comparison should not be pushed to extremes. First, the pressure of population in Java is such that the Javanese must work far harder to secure a living than is necessary for the people of Malaya; and secondly, the Javanese who can derive an income from rubber cultivation are very few. In Malaya, more than 1½ million acres of rubber are in the hands of small-holders, and our total population is less than 5,000,000 people. In Java the population exceeds 40 million and the small holdings of rubber are only 37,000 acres.

Nevertheless, we are faced with the unpleasant fact that we are dependent on outside sources for two-thirds of an essential article of food, and that in time of emergency these supplies may be wholly or partially cut off or may be procurable only at enormous cost which would inevitably involve increases in taxation. I am told that during or shortly after the Great War rice was \$1 a gantang which is equivalent to \$15.16 a picul.

A new feature of this Exhibition is a map of Malaya at the far end of the main building. On it you will see the areas now under padi cultivation and the areas that are still available, and suitable, for padi cultivation. There is no doubt at all that the production of padi in Malaya could be vastly increased if only we had the farmers; and the question which we have to face to-day is: "Are we going all out for that increase; or are we going to continue to accept the very real risk of short commons if not actual starvation in time of emergency?"

In times like this, when it is the bounden duty of every country within the Empire to defend itself against whatever may befall, there can be only one answer: The land is here, and the population is here; it remains for proper opportunities to be given to Asiatics other than Malays to take up the cultivation of padi. I am glad to say that the State of Johore has already adopted this policy and I trust that the other States will follow this lead without delay. There is no question of depriving the Malays of the use of any land which they can cultivate: the map will show you that there is ample for them and for others as well. Of the 1½ million acres of small holdings under rubber, by far the largest proportion is in the hands of Malays; and there is no reason why Malays and other races of Asiatics should not grow padi side by side just as they cultivate rubber. All that I ask, therefore, is that suitable land which is not and cannot be put under cultivation by Malays shall be made available to others. And I say that by accepting this policy the State Governments will make a real and practical contribution to the defence of the Empire.

I know that what I have said will not be popular in some quarters and I realize that it will be criticised. But I say again that we are living in critical times, and it would be wrong of me to gloss over with smooth words the serious nature of the position here in regard to food supplies. I believe that as a general rule people prefer to know exactly how they stand even though they may not like it, and I ask my critics to ponder before they speak or rush into print, and to ask themselves what other course is open. If they can think of a better course, I shall be very ready to consider it; but if they cannot, then I hope that they will be honest with themselves and me, and say so.

Your Highnesses, ladies and gentlemen, I declare this Exhibition to be open, and I offer on your behalf my cordial thanks to all those who have worked so hard to ensure its success."

Competitive Sections.

All-Malayan Padi Competition.

This competition was organized for the sixth consecutive year on a Malayan basis. The final stage—or Central Competition—is held in conjunction with the Malayan Exhibition, and is the culmination of numerous small local Padi Competitions, larger District Agricultural Shows and State Shows. Prize-winning exhibits thus may have competed in three competitions before appearing at Kuala Lumpur.

The following table summarizes the intermediate Shows which have been held.

Territory	Local Padi Competitions	District Shows	State Shows
Kedah (northern area) ...	—	1	—
Kelantan ...	—	5	1
Penang ...	—	1	—
Province Wellesley ...	9	3	—
Perak ...	36	9	1
Selangor ...	10	6	—
Pahang ...	57	6	1
Negri Sembilan ...	23	2	—
Malacca ...	15	3	—
Johore ...	—	1	—

The number of exhibits received for the Central Competition from each of these States and Settlements was as follows:— Penang and Province Wellesley 12 (15), Kedah 3 (0), Kelantan 2 (3), Perak 54 (33), Selangor 17 (18), Pahang 12 (13), Negri Sembilan 10 (15), Johore 6 (0), Malacca 14 (12), total 130 (109). The figures in brackets are for 1938.

The general standard of padi was surprisingly low, except for a number of good exhibits of long-grained Siam type chiefly from Malacca and Kuala Selangor. The three exhibits from North Kedah were also of this type, of which two were fairly good but not well enough ripened.

Penang and Province Wellesley sent a miscellaneous collection of medium-grained varieties, all below prize-winning quality, which is unusual.

Perak sent in 54 exhibits, all but two of which were unexpectedly poor in quality, particularly 24 Radin Merah exhibits and 14 Seraup type exhibits.

Selangor had a difficult padi season, with dry weather, in scattered or young padi areas, but the standard of exhibits made a distinct advance on that of other years. It was particularly interesting to see several good long-grained Siam or Mayang Rotan exhibits from the important young Panchang Bedena and Tanjong Karang areas of Kuala Selangor.

Pahang also had a difficult season with drought in October last, and then floods. Of the 12 exhibits sent in, four were short-grained Milek varieties, five were medium-grained Radin Kuning, and three were bold-grained Padi Kampar.

Exhibits from Negri Sembilan were below average quality, and the State Agricultural Officer sent fewer than the maximum on this account. These included fair samples of Serendah Kuning, a popular medium bold-grained variety of padi, and three samples of Seraup, one of which was good. The grains of this exhibit,

however, were not too well filled and it was awarded only a second prize, being the only prize given in the Seraup class.

Johore sent two exhibits of Nachin Puteh and one very good one of Serendah Kuning which won a first prize. Johore had a good season for padi cultivation.

Kelantan sent in only two exhibits, one of which, a long-grained Anak Naga, gained a third prize.

Malacca's exhibits included ten of Siam type, two of Nachin type and one of Serendah Kuning. Of these the Siams were much the best, gaining first, second, and a third prize in this class. The first prize also gained the special gold medal for the best exhibit of the competition. This exhibit was an excellent sample of Siam, very well ripened and with well filled grains. It did not appear to be the Department's selection, Siam 29, as were most of the other Siams. Malacca was also awarded the shield for the superior quality of its exhibits.

A feature of the competition was the general poor quality of exhibits from the north of the country—Kedah, Province Wellesley and Perak—the fault being uneven ripeness, under-ripeness and poorly filled grain.

The season in Kedah has been good with a record harvest of grain; crops in Province Wellesley have been very good, and those in Perak have also been better than last year, yet there is this unexpected default in quality, due presumably to various difficulties of water control at harvest time.

Prize winners are as follows:—

Long Grains—1st prize for Siam from Alor Gajah, Malacca.

—2nd prize for Siam 29 from Paya Rumpat, Malacca.

—3rd prize, three awards for Siam 29 from Alor Gajah, Malacca, Anak Naga from Kota Bahru, Kelantan, and Siam 29 from Tanjong Karang, Kuala Selangor, Selangor.

Seraup type—2nd prize for Seraup from Labu, Negri Sembilan.

Radin types—1st prize for Serendah Kuning from Labis, Segamat, Johore.

—2nd prize for Radin Kuning from Kuala Kangsar, Perak.

Judging this year was comparatively easy on account of the large number of exhibits which were quickly discarded on account of the faults already mentioned, uneven ripeness being the most common.

It is of interest to note the trend of types of padi:— Penang—Mayang Sabatil; Province Wellesley—various medium grain types; Perak—Seraups and Radins; Pahang—short and medium grain varieties; Negri Sembilan and Johore—no selected strains, Serendah Kuning notable; Selangor—long grain Siam and large grained Kelantan types; Malacca—Siam.

In spite of the generally poor standard of padi samples exhibited this year, there is no doubt that the percentage of samples containing pure or unmixed grain has greatly increased during the six years. This is the point that has been most emphasized in competitions so far, and it appears to have had some effect.

All-Malayan Small-Holders' Rubber Competition.

This competition is organized on the lines of the padi competition, and entries are confined to sheet rubber produced and smoked on holdings of less than 25 acres. This year a total of 130 entries was received.

The average quality of the rubber was lower than in the past two or three years, but the prize-winning exhibits were of the usual high standard. The chief defect of the poorer entries was dirt. Another serious fault was stickiness, mostly caused by insufficient washing but in a few cases due apparently to the use of sulphuric acid as a coagulant. The need for unremitting care and cleanliness is still evident.

Eight equal prizes were awarded, five going to small-holders in Pahang, one to Brunei, one to Selangor, and one to Negri Sembilan. The prize winners comprised five Malays and three Chinese.

Agricultural Section.

In recent years the policy of the organizers of this Section has been altered; late entries are not accepted and exhibits not considered up to the standard of an exhibition organized on a Malayan basis are rejected. The result has been a diminution in the total number of exhibits displayed, which has permitted more satisfactory display of selected exhibits and increased the importance and value of the Section.

This year the exhibits were generally of a high standard, and few submitted were unsuitable for display. The total number received was 3,371 of which nearly 1,600 were fruits and vegetables. The complete absence of hill vegetables was noticeable.

The quality of the vegetables was remarkable in view of the long preceding period of drought. A record number of exhibits of Chinese green tea was shown, but the classes for black tea were not so well supported as those for green tea. The exhibits of prepared coffee were poor in quantity and quality. Soap made by small producers showed marked advance on previous years. The exhibits of small-holders' copra were remarkably good, showing a great advance on previous years, and were representative of the whole of Malaya with the exception of Johore.

The Section was constantly crowded with visitors who took a keen interest in exhibits, and it would sustain such interest if all classes were clearly labelled with the name of the product.

Horticulture.

This Section benefited from being housed in one of the new permanent buildings, which had been specially designed to accommodate horticultural exhibits. The result was extremely successful and marked a further step in the general development of the Exhibition.

There was a very fine commercial display of flowers from Fraser's Hill, recalling the fact that Malaya imported in 1938 fresh flowers to the value of over \$24,000.

Poultry.

This Section gained from being housed in part of one of the new buildings, and a large number of entries was received. Small-holders' exhibits of pure-bred birds were again noteworthy, and, for the first time the special awards, with one exception, were awarded to Malay exhibitors. The gold medal awarded for the best bird in the Show was won by a Malay small-holder.

Quite a brisk business was done in sales of exhibits in spite of the high prices demanded by owners.

Cats and Aquatic Section.

A portion of one of the new buildings was allotted to the Cats Section which this year was held on the first two days instead of on the third day as in previous years. There was a satisfactory number of entries and some very fine cats were displayed. The new penning arrangements were a considerable improvement.

An innovation was the aquatic group for exhibits of miniature aquariums which produced a good response and was of considerable interest to sightseers. There was also a miscellaneous group for rabbits, guinea pigs and squirrels which was well supported by exhibitors.

Arts and Crafts.

Village Industries.

There are two distinct groups in the Village Industries Section, the competitive classes and the State stalls. The latter group this year was housed in the largest of the new buildings, which will be its permanent home. The new building permitted a much improved lay-out while also allowing much more space for visitors, and this Section was probably the most popular of the Exhibition.

Nearly the whole of Malaya was represented by State stalls this year: Perak, Selangor, Negri Sembilan and Pahang; Kedah, Kelantan, Trengganu and Brunei. Malacca was the only Settlement to exhibit and there was also the stall of the Sultan Idris Training College, Tanjong Malim, Perak. Selangor was represented by two stalls but these were in the main building at the special request of His Highness the Sultan, and rent was paid for them as in the case of trade stalls.

The Kelantan stall won the Governor's Cup for the third year in succession for the best stall in the Section, and had a particularly wide range of silverware and locally-woven materials on sale and display.

The noticeable feature of this group was the large number of craftsmen actually at work, who were a constant source of interest to sightseers. There were workers from Selangor, Pahang, Kelantan and Trengganu weaving on cottage looms, potters from Perak and Kedah, a silversmith from Kedah, Malay girls from Malacca making mats and bags, and men from Negri Sembilan and Pahang turning wooden tops on primitive, but very efficient, lathes. The Brunei stall, in addition to a display of silver work, had a very fine collection of Brunei gongs for sale which occasioned much interest.

The value of this group can be gauged from the fact that total sales were in the neighbourhood of \$7,000 irrespective of orders of which Kelantan's share will keep their workers occupied for three months.

The competitive group of this Section was housed in the main building, but it suffered from the development of the State stall group, and entries received were disappointing both in numbers and quality when compared with previous years. Sales of exhibits, which in 1938 were over \$400, totalled only \$221.

School Industries.

The competitive Schools Section is divided into four main groups; i. English Schools—Boys; ii. English Schools—Girls; iii. Malay Schools—Boys; iv. Malay Schools—Girls. The standard of exhibits was very high, and only the best exhibits were displayed.

Several schools had their own stalls, and a notable stall was that of the Pensionnat Notre Dame, Cameron Highlands, which displayed work of a very high standard.

This year a separate building was allocated to the Trade Schools, of which there are five: Kuala Lumpur, Singapore, Penang, Johore and Malacca. Exhibits ranged from machinery to furniture and tailoring and were a valuable indication of the work carried out in these schools.

Needlework and Handwork: Preserves and Confectionery.

Both these Sections were well supported and exhibits reached a high standard. The Needlework and Handwork Section is confined to handmade articles. The Preserves and Confectionery Section, which last year was not included in the Exhibition, made a welcome re-appearance. Unfortunately it had to be accommodated in the main building and thus suffered to a certain extent from dust.

Art and Photography.

The total number of exhibits received was 468, thus again creating a record. In 1938 exhibits numbered 439, and in previous years did not reach 300. Owing to this large entry the space allotted to the Section was completely inadequate, but the organizers are to be congratulated on the results achieved with the limited space available.

The outstanding feature of the Section was the surprisingly high standard reached by so many of the exhibitors and this was particularly noticeable in the group for water-colours. Several oils were of outstanding merit, and consideration will have to be given to the provision of classes for amateurs and professionals as is already done in the photography group.

The photography classes did not show the same marked improvement over former years, the professional exhibits, with certain marked exceptions, failing to reach previous standards.

Trade Section.

The Trade Section has not yet regained the size and importance which it reached a few years ago, but this year there was a very satisfactory display, staged as usual in the main building of the Exhibition. It included two Selangor State

stalls organized by the Raja Bendahara of Selangor, and displays by the F.M.S. Railways, and Electrical, and Posts and Telegraphs Departments. The Malay Regiment again had a stand in this Section on which were displayed the new Bren guns and an anti-tank gun.

Departmental Exhibitors.

The Department of Agriculture was responsible for the staging of the All-Malayan Padi Competition, and certain of its officers were the organizers of the Agricultural and Oils and Fats Section. In addition there were on display examples of the food crops recently recommended for cultivation on estates.

The Rubber Research Institute of Malaya again organized the All-Malayan Small-Holders' Rubber Competition, and in addition kept open its laboratories during the period of the Exhibition for inspection by interested visitors. Members of the staff were in attendance for consultation, and demonstrations of budgrafting were given at the Institute for the benefit of small-holders. In addition to the demonstrations, exhibits were displayed showing the complete operation of budgrafting as detailed in a recent publication of the Institute. The demonstrations were well attended and a total of over 400 persons visited the Institute.

The Electrical Department had an attractive stall demonstrating a vertical gravel pump for use in open-cast tin mines.

The F.M.S. Railways displayed machine-shop equipment used at their workshops in addition to providing facilities for dealing with enquiries and the sale of tickets.

The Posts and Telegraphs Department provided a Post Office for the convenience of visitors to the Exhibition, and also staged an extremely interesting display of technical equipment used in connexion with the Department's various services.

The Medical Department has its own permanent building and staged comprehensive instructional exhibits dealing with infant welfare work, anti-mosquito measures and general sanitation.

The Exhibition authorities had prepared, with the co-operation of the Surveys Department, a very large map of Malaya which was displayed in the main building showing padi areas and other areas under agricultural development together with comparative figures of rice production in Malaya and the Netherlands Indies.

Entertainments.

A large and varied programme of entertainments was provided throughout the three days of the Exhibition. Of particular interest was the film "The Five Faces of Malaya" which was shown for the first time in Malaya at the Exhibition. The Wuhan Songsters gave special programmes each night in the Stadium. A top-spinning competition in which 23 teams took part created considerable interest and attracted large crowds daily.

Football matches and the Malayan Cycling Championship were held in the Stadium. Beating of "Retreat" took place each evening, being played in turn by the band and drums of the 2nd (Sel.) Battalion of the F.M.S.V.F., Malay Regi-

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ment and F.M.S. Police. The F.M.S. Police Depot staged their popular *Bangswan*, and a Penang "Boria" was given on two evenings.

A cine-film competition was organized for the second year in succession, and films were displayed for judging in the cinema hall.

Acknowledgments.

Acknowledgment is made to Mr. R. B. Jagoe, Botanist, for the report on the All-Malayan Padi Competition, to the Rubber Research Institute of Malaya for the report of the judges of the All-Malayan Small-Holders' Rubber Competition, and to various Section Secretaries for material incorporated in this report.

Received for publication 24th August 1939.

Abstract.

REPORT ON A VISIT TO MALAYA

BY

SIR FRANK STOCKDALE, K.C.M.G., C.B.E.,

Agricultural Adviser to the Secretary of State for the Colonies.

Sir Frank Stockdale visited Malaya in response to a request from the Governor of the Straits Settlements and High Commissioner for the Malay States, who indicated that the Adviser on Agriculture desired to discuss certain matters concerning Malayan agriculture and agricultural policy in the Peninsula generally. Sir Frank spent a total of five weeks in Malaya, during which he visited all the Settlements and States in the Straits Settlements and Federated Malay States respectively, and the Unfederated States of Johore, Kedah, Kelantan and Trengganu. Subsequently he visited the Netherlands Indies and Ceylon.

His report on Malayan agriculture runs to some sixty pages, subdivided into sections of which the following are the more important:—

Political Divisions and Agricultural Industries.

Soil Conservation.

Rubber, Rice, Coconuts, Pineapples.

Tea, Fruits and Vegetables, Cinchona.

Oil Palms, Arecanuts, Derris, Coffee, Cacao, Tobacco.

Agricultural Experiment Stations.

Agricultural Education.

Co-operation.

The Cameron Highlands.

Rejuvenation of Mining Lands.

Summary of Conclusions.

The last section is of greatest interest to the general reader and is printed below in full. In some cases additional information has been added to the summary from the body of the report, in order that certain generalizations which otherwise are intended to be amplified by reference to the report itself may be clarified for the reader who has not access to it.

Summary of Conclusions.

1. Malayan soils are generally of low fertility and it has been fortunate that a tree crop such as rubber has been found suitable for cultivation on the quartzite soils.

2. As far as rubber is concerned, it is concluded that the Rubber Research Institute is doing most valuable work for the industry. Further attention should be given both by the Institute and by rubber-growing interests to the establishment of cover crops as a check to soil erosion. In old rubber this is often difficult but experience elsewhere indicates that it should not be impossible if use is made of

phosphatic manures. Further efforts in this direction are clearly desirable, particularly as the value of phosphatic manuring in rubber in Malaya has been proved. Cover crops are now freely used in young rubber in replanted or newly-planted areas, but there is evidence that growth is somewhat retarded in the early years by reason of root competition. It has yet to be determined whether this effect is continuous and there can be little doubt that for the maintenance of soil fertility and as a check to erosion the use of cover crops is desirable. It is suggested that trials be made with lopping covers grown in young rubber and using these loppings as a mulch around the young rubber plants.

3. The importance of continuing without interruption plant breeding work with rubber is considered to be of importance.

4. Greater use of compost in the nurseries where rubber budwood is being produced should be beneficial.

5. The small-holders' advisory service of the Rubber Research Institute is doing useful work and it is suggested that type plans of smoke-cabinets should be prepared for issue to interested applicants. It is also suggested that middlemen purchasers of wet rubber from small-holders should be encouraged to erect smoke-houses for the production of smoked sheet and consideration given to the possibility of licences to buyers being made conditional, after a due period of time, upon the erection of smoke-houses of approved design.

6. Malaya produces only about 40 per cent. of its rice requirements, and the measures taken in 1932 to improve this position should be continued without abatement. The work of the Drainage and Irrigation Department and of the Department of Agriculture in connexion with the rice industry has been productive of considerable advances. There is a need for a greater production of rice in the State of Johore and in Kelantan progress would be hastened if a Drainage and Irrigation Engineer were appointed to and stationed in that State.

7. The work of the Department of Agriculture for the padi industry is organized on sound lines, and considerable progress has been made, particularly in the selection, testing and distribution of pure-line strains of padi. A review of the manurial trials undertaken at the Padi Stations of the Department of Agriculture is, however, proposed and further work in the study of the agricultural aspects of cultivation is foreshadowed. A greater measure of flexibility in the work of Padi Experiment and Test Stations is also suggested. Reference is made to some of the very useful indigenous implements used in the padi industry of Malaya. Some of these are well worthy of trial in other parts of the Colonial Empire.

8. It is possible that the development of mango-growing in the padi areas in Kedah and Kelantan should be practicable. Such cultivations, by providing a money-crop, would help to improve the economic conditions of the small-holders.

9. Further scientific investigations in connexion with parboiled rice under present-day methods of production in the larger rice mills are suggested, as there have elsewhere been recent changes in the method of parboiling. There is no doubt, also, that Eastern countries can make no greater contribution to the cause

of nutrition than by the encouragement of the production of undermilled rice and that Malaya, by virtue of its Government-controlled rice mills, is well placed to take the lead in the furtherance of this movement.

10. The Department of Agriculture has done very good work by its copra investigations, and the manufacture of copra has greatly improved in recent years. To assist small-holders growing coconuts, it is proposed that the Department of Agriculture should prepare printed type plans of the copra-drying kilns which have been successfully evolved. Middlemen purchasers of coconuts for conversion into copra should be encouraged to erect kilns of the approved types and if necessary a condition to this effect might be introduced into buyers' licences.

11. If plant-breeding work for coconuts is to be continued, a new Experiment Station on land suited to the cultivation of this crop will be required.

12. The tea industry, with assistance from the Department of Agriculture, should endeavour to make in Malaya green tea, in order that imports of this commodity may be replaced by the products of local production.

13. The improvement of the pineapple industry has received attention by the Department of Agriculture and as the result of its efforts considerable improvements have been effected in pineapple factories. Many of them have been rebuilt and in all sanitary conditions have been greatly improved. Grading of produce is now accepted as being desirable and steps are being taken by the industry to improve marketing organization. The fairly widespread occurrence of mealy bug wilt of pineapples is, however, recorded and this has been confirmed by the Entomologist to the Hawaiian Pineapple Experiment Station. Control by spraying should be possible but the trial of predators is suggested. Further attention will have to be given to the maintenance of soil fertility if pineapples are to continue to be grown successfully in mono-culture in Malaya.

14. The problem of maintaining soil fertility on the high lands is the major agricultural problem in Malaya, and its solution will be of the greatest benefit to agriculturists generally. The small-holders require assistance in developing increased productivity of their kampong lands and it is recommended that the work of the district Agricultural Stations should be reconsidered and steps taken to ascertain by experiment the directions in which small-holders' agriculture can be profitably advanced. A number of suggestions are made for consideration, which are largely based on experience gained in other parts of the wet tropics that the cultivation of tree or orchard crops offers greater possibilities of success than the cultivation of annual crops which necessitate that the soil shall be uncovered to the destructive agency of leaching and other losses of fertility during periods of the year at which planting and early growth of annuals take place. Oil palm, coffee, fruits, cacao, and arecanuts are suggested as crops which ought to receive more attention from the small-holder, possibly associated with the introduction of livestock into *kamong* agriculture.

15. Increased attention can undoubtedly be given to the development of fruit cultivation and it is suggested that a new post of Horticulturist or Fruit Specialist should be created in the Department of Agriculture with this object in view.

16. Agricultural Education is briefly reviewed and it is suggested that there is need for the provision of training in padi, coconut and pineapple cultivation in addition to that given in the present courses. Agreement is expressed with the remodelling of the Farm School, Malacca, and it is indicated that the improvement of the agricultural training provided at the Sultan Idris Training School is most desirable.

17. The problem of the rejuvenation of lands after they have been mined is referred to, and suggestions made in respect of planted shrub or forest cover in order to provide a more rapid accession of organic matter than is customary when these lands are left to Nature.

18. Frequent references are made to the necessity for attempts at the introduction of mixed farming into peasant agriculture in order that soil fertility may be maintained. The value of the use of mulches is also referred to and further trials with composts would seem to be indicated. The subject of animal husbandry has not, however, been dealt with as this matter is under separate consideration by the Governments of Malaya and the Secretary of State.

D.

Departmental. FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

August, 1939.

The Weather.

A normal amount of rain fell in Kedah during August, most of it during the first part of the month. Similarly in Penang and Krian precipitation was up to normal and water supplies were adequate.

Throughout the greater part of the country the dry weather prevailing during July continued and very dry conditions were experienced in some parts. In the extreme south-west of the Peninsula ample rain fell.

Dry conditions also prevailed in Pahang but the occurrence of thunder showers prevented serious drought. At Pekan steady and heavy rain fell.

Crop Reports.

Padi.—In Kedah despite the shortage of rain during the second half of the month water supplies were adequate. In other parts of the country the dry weather has largely held up work in the rice fields, except where irrigation supplies were sufficient.

Malacca padi planters have been particularly unfortunate this season. For the past three months rainfall in this Settlement has been very much below normal. Some heavy showers in the first half of the month enabled cultivators to make a start but hot dry weather for the remainder of the month dried out the land again.

In Kelantan the weather has been favourable for the dry rice crop and most of the land under this crop has now been planted and is growing well. Wet padi planting has been delayed as the usual seasonal rains have not yet commenced.

In the Panchang Bedena area cultivation has recommenced. During the off-season many cultivators planted maize, beans and soya bean on their padi land both for their own consumption and for sale. It is estimated that about 500 acres were planted with maize. A further 100 to 150 Banjarese and Javanese settlers, most of whom came from Perak, have arrived in the area during the past 2 months.

Sungei Manik Padi Area. In Stages I and II of this area cultivation is proceeding satisfactorily. In Stage III, which is now in process of settlement, it is estimated that the felling of jungle has been completed over approximately 5/6th of this area. Some of the lots have been burned and cleared and are now fully planted with maize, dry padi and topioca. Other lots are still only partially cleared. It is fortunate for the new colonists that the last few months have been so very dry—most favourable weather for clearing this type of land. Felling of this swamp

jungle is very laborious owing to the mass of aerial roots which are extremely difficult to dispose of. It has been estimated that the cost of clean clearing such land with hired labour would work out at more than \$120 per acre.

In Stage IV of this area 483 six-acre lots (2,848 acres) have already been alienated. A further 893 lots are still available. The west and lowest end is being colonized first. The new settlers in this stage have commenced clearing their land. Of the 483 men who are settling in this area, 364 come from the Perak river mukims, chiefly Pasir Panjang Ulu; 20 come from Sungei Manik itself, and 119 come from other localities.

Rubber.—The price of rubber remained at much the same level as during the preceding month, though a small increase occurred in some places. The value of coupons has tended to decrease, while uncoupons rubber has increased in price. The latter was selling at more than \$10 per picul in some districts.

The increase in price of uncoupons rubber has resulted in a revival of tapping on small holdings.

In parts of Selangor it is reported that owing to the drought and consequent difficulty in obtaining good clean water, some inferior dirty sheet is being produced.

Pineapples.—All factories after packing the remainder of their quota ceased operation during the month. When Singapore factories ceased working growers on the Island had little fruit left. By the end of August little fruit remained in Johore plantations. A small proportion of this large quantity of surplus fruit was sold for consumption locally. Pineapples were even offered as free gifts to people entering one of the Singapore amusement parks, and one lorry load, in the absence of a better offer, was sold for \$3 for cattle food.

Cocoanuts.—The uncertain international situation had a depressing effect on copra prices. In the Batu Pahat District it is reported that despite the lower price of copra Chinese producers are continuing to pay a high price for nuts, and Malay producers are finding it difficult to compete.

Buffaloes for Brunei.

The Brunei Government are continuing their policy for the introduction of buffaloes into the State. Forty-five more buffaloes were imported during August and were disposed of to padi planters. Arrangements have now been completed for importing a further 25 animals every fortnight.

FERTILIZER PRICES, SEPTEMBER, 1939.

The following are the prices current for the month of September, 1939, of some of the more important fertilizers.

Product.	Analysis				Price per ton \$	
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)		
		Soluble	Insoluble			
Sulphate of Ammonia	...	20.6	—	—	—	72.75
Calcium Cyanamide	...	20.6	—	—	—	80.00
Muriate of Potash	...	—	—	—	50	112.00
Sulphate of Potash	...	—	—	—	48	112.00
Superphosphate (concentrated)	...	—	39	—	—	105.00
Superphosphate	...	—	16-18	—	—	60.00
Basic Slag	...	—	—	16	—	48.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are \$95, \$50 and \$31.50 per ton respectively.

Statistical. MARKET PRICES.

August, 1939.

Major Crops.

Rubber.—The market was comparatively steady throughout the month until the close, when, owing to the increasing European tension, prices commenced to rise. No. 1. X. Ribbed Smoked Sheet, loose, opened at 28 9/16 cents per lb. in Singapore, fell to 27 3/4 cents on the 24th, rose steadily to 29 cents on the 30th, and closed at 29 1/8 cents.

The average of daily quotations for the month was 28.51 cents per lb., as compared with 28.27 cents in July. The London average price was 8.57 pence per lb., and New York 16.56 cents gold, as compared with 8.27 pence and 16.44 cents gold in July.

Prices paid for small-holders' rubber at three centres during the month are given in Table 1.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, August, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak			Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.		
	2	23	30	3	10	17	2	9	23
Smoked sheet ...	35.10	35.00	38.15	35.50	—	35.60	34.90	—	—
Unsmoked Sheet ...	—	—	33.00	34.30	34.00	34.00	34.20	33.60	33.78
Scrap ...	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 9th and 16th August, at Kuala Pilah on the 24th and 31st August, and at Batu Pahat on the 16th and 30th August.

Palm Oil.—Prices remained at the closing July levels, and August quotations are given in Table II. The averages of the July quotations were:—palm oil £12.7.6, kernels £8.3.1.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1939.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
August 3	£ 12. 5. 0	£ 8. 0. 0
„ 10	12. 5. 0 Liverpool	8. 2. 6 Hamburg
„ 17	12. 5. 0 „	8. 2. 6 „
Average	£ 12. 5 0	£ 8. 1. 8

Copra.—Prices fell heavily in the second half of the month. The sun-dried grade was quoted in Singapore at \$3.60 per picul until the 14th August when it commenced to fall, the price weakening steadily to close at \$3.20. The Singapore average price for the month was \$3.50 per picul as compared with \$3.59 in July. The mixed grade averaged \$3.15 as against \$3.24 in July.

Copra cake was quoted throughout the month at \$2 per picul as compared with the July average of \$1.76.

Rice.—The Singapore average wholesale prices of rice per picul in July were as follows:—Siam No. 2 Ordinary \$3.64, Rangoon No. 1 \$3.55, Saigon No. 1 \$3.37 as compared with \$3.75, \$3.40 and \$3.35 in June, and with \$4.39, \$3.92 and \$4.02 in July 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were:—Singapore 26, Penang 31, Malacca 28, as compared with 26, 32 and 28 in June.

The average declared trade value of imports during July was \$3.66 per picul as compared with \$3.68 in June and \$3.76 in May.

Padi.—The Government Rice Mills, Perak and Pahang, continued to pay \$2.20 per picul for padi. Retail prices of padi per 100 gantangs (gallons) ranged from \$7 to \$14 in several parts of the Peninsula. In Kedah the price was \$7.30 to \$7.50, in Penang and Province Wellesley \$8.80, in Krian \$9, in Kelantan \$9.20, and in Malacca \$8 to \$10.

Pineapples.—There was no change in prices, which are controlled by the Central Board of Packers. Prices, per case of 48 cans of 1½ lbs. each, were G.A.Q.: Sliced Flat \$3.20, Sliced Tall \$3.35, Cubes \$3.25; Golden: \$3.60, \$3.75 and \$3.65 respectively.

Fresh fruit prices per 100 were as follows:—Singapore 60 cents to \$2.10; Selangor 80 to 90 cents medium, and \$1 to \$1.10 large; Johore 1st quality, \$2, 2nd quality 70 cents, 3rd quality 50 cents.

Beverages.

Tea.—Five consignments of Malayan highland tea, comprising 432 packages, were sold on the London market during August at prices ranging from 1s.2d. to 1s.3d. per lb., the average price being 1s.2.45d. Eight consignments of lowland tea, comprising 454 packages, were sold in London at prices ranging from 10 $\frac{3}{4}$ d. to 1s.0 $\frac{3}{4}$ d., the average being 11.91d.

The average London prices per lb. realized for tea from other countries, according to the *Tea Market Reports* for August of the Tea Brokers' Association of London, were as follows:—Ceylon 1s.2.83d., Java 1s.1.47d., Indian Northern 1s.3.94d., Indian Southern 1s.1.07d., Sumatra 10.95d.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 29th August, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 92, Medium Grown Teas 77, Low Grown Teas 68.

Coffee.—Liberian coffee continued to be quoted in Singapore at \$15 per picul throughout the month. Excelsa and Robusta were quoted throughout the month at \$10 and \$6.75 respectively.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$11.10 to \$12.80 per picul, and for Sourabaya coffee \$9 to \$10.35.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul were:—Best \$5.50, Medium \$5.20, Mixed \$4.55.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.05 to \$5.40, Red Whole \$4.30 to \$5.55, Sliced \$8.70 to \$10.65, as compared with \$3.37 to \$5.50, \$3.37 to \$5.29, and \$7.94 to \$10.37 in July.

Pepper.—There was no change in Singapore prices of pepper which were, per picul:—Singapore Black \$7.25, Singapore White \$11.25, Muntok White \$11.50.

Nutmegs.—Prices continued unchanged, both 110's and 80's being quoted at \$28 per picul. Penang dried nutmegs were sold at \$19 per picul.

Mace.—Siouw remained unchanged, being quoted nominally at \$85 per picul. Amboina fill from \$53 to \$46 per picul, averaging \$51.50 for the month as against \$55 in July. Locally produced mace, dry, was sold in Penang at \$70 per picul.

Cloves.—Nominal quotations in Singapore continued unchanged at \$40 per picul for both Zanzibar and Amboina. Penang cloves, dried, sold in Penang at \$45 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 28th August, 1939, from Rs. 1.20 to Rs. 1.49 per lb.

Miscellaneous.

Derris.—The Dennis patent has been invalidated by the United States Circuit Court of Appeals and as a result cubé, or timbo root, the most important competitor of derris in the United States, is now free from royalty payments. The saving in royalty is equal to £7 per ton.

During August some transactions with America at remarkably low figures were recorded and average prices for the month fell still further. Roots sold on a basis of ether extract averaged \$7.25 to \$8.50 per picul, and on rotenone content \$16.50 to \$17.50. The July average price were \$7.50 to \$9 and \$17.50 to \$18.50 respectively.

Gambier.—Prices continued unchanged in Singapore: Block \$8 per picul nominal, Cube No. 1 \$17.

Sago.—Prices improved again in Singapore, Pearl rising 15 cents per picul, and Flour 20 cents. Pearl averaged \$4.09 per picul and Flour, Sarawak Fair, averaged \$2.50. The July averages were \$4.09 and \$2.49 respectively.

Tapioca.—Flake Fair improved in Singapore to average \$4.06 per picul. Seed Pearl fell, averaging \$4.32, and Medium Pearl fell to \$4.60. The July averages were \$4, \$4.50 and \$5 respectively.

Tobacco.—Prices of dried leaf in Johore ranged from \$5 to \$30 per picul, and for prepared tobacco from \$10 to \$130. In Malacca the range was \$20 to \$25. The general range elsewhere was: 1st quality \$14 to \$30, 2nd quality \$8 to \$22, 3rd quality \$5 to \$18. Prices for prepared tobacco in Kelantan were: 1st quality \$80 to \$160, 2nd quality \$60 to \$130, 3rd quality \$40 to \$115.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY*

July 1939.

Malaya.—Imports of foreign rice during July were 51,898 tons†, and exports 13,918 tons. Net imports were accordingly 37,980 tons, as compared with 50,397 tons in 1938¶.

Of the July imports 45 per cent. were consigned to Singapore, 15 per cent. to Penang, 9 per cent. to Malacca, 22 per cent. to the Federated Malay States, and 9 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):—Thailand 36,787 (70.9), Burma 11,285 (21.8), French Indo-China 3,078 (5.9), other countries 748 (1.4).

Of the exports during July, 71 per cent. were consigned to the Netherlands Indies and 29 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 11,031 (79.3), Burma 1,953 (14.0), French Indo-China 849 (6.1), parboiled 18 (0.1), Malayan production 67 (0.5).

July net imports by countries of origin were (in tons, percentages in brackets):—Thailand 25,756 (67.8), Burma 9,332 (24.6), French Indo-China 2,229 (5.9), elsewhere 663 (1.7).

India.—Foreign exports during the first half-year were 159,000 tons, as compared with 137,000 in 1938, an increase of 16.1 per cent. Of these exports 3.1 (3.7) per cent. were to the United Kingdom, 1.9 (5.8) per cent. to the Continent of Europe, 32.1 (38.0) per cent. to Ceylon, 3.8 (5.1) per cent. to the Straits Settlements and the Far East, and 59.1 (47.4) per cent. to other countries. The percentages in brackets are for the corresponding period in 1938.

Burma.—Foreign exports from the 1st January to 26th July totalled 2,640,941 tons, as compared with 2,191,180 tons in 1938, an increase of 20.5 per cent. Of these exports 56.9 (42.0) per cent. were to India, 7.8 (9.4) per cent. to the United Kingdom, 7.7 (8.6) per cent. to the Continent of Europe, 8.8 (11.1) per cent. to Ceylon, 8.7 (13.6) per cent. to the Straits Settlements and the Far East, and 10.1 (15.3) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average July prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 219, Small Mills Specials 223.

Thailand.—Exports of rice and rice products from Bangkok during January to May were 796,628 tons, as compared with 698,490 tons in 1938.

* Abridged from the Rice Summary for July, 1939, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.).

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

Japan.—The latest information available was published in the June Summary.

French Indo-China.—Entries of padi into Cholon during January to July totalled 1,176,082 tons, as compared with 771,255 tons in 1938, an increase of 52.5 per cent. Exports of rice during the same period were 1,104,173 tons, as compared with 796,673 tons in 1938, an increase of 38.6 per cent.

In Saigon white rice No. 1 opened in July at \$2.65 per picul, rose to \$2.69 in mid-July, and closed at \$2.44.

The Netherlands Indies.—The latest information available was published in the March Summary.

Ceylon.—Imports during January to July totalled 355,522 tons, as compared with 327,813 tons in 1938, an increase of 8.5 per cent. Of these imports 14.2 (17.4) per cent. were from British India, 63.1 (71.3) per cent. from Burma, 0.3 (0.3) per cent. from the Straits Settlements, and 22.4 (11.0) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 14th July totalled 940,079 tons, as compared with 845,745 tons in 1938, an increase of 11.2 per cent. Of these shipments 37.5 (43.9) per cent. were from Burma, 46.5 (46.5) per cent. from Saigon, 15.1 (8.1) per cent. from Thailand, and 0.9 (1.5) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments for the Levant from 1st January to 27th June totalled 14,065 tons, as compared with 24,455 tons in 1938, a decrease of 42.5 per cent. Shipments for Cuba, West Indies and America from 1st January to 8th July were 114,194 tons, as compared with 112,141 tons in 1938, an increase of 1.8 per cent.

MALAYAN AGRICULTURAL EXPORTS, JUNE, 1939.

PRODUCT.	Net Exports in Tons				
	Year 1938	Jan./June 1938	Jan./June 1939	June 1938	June 1939
Arecanuts ...	33,769	22,257	19,984	4,514	4,103
Coconuts fresh†† ...	116,743†	50,453†	49,175†	14,039†	9,420†
Coconut oil‡ ...	49,140	21,259	28,358	3,674	4,988
Copra‡ ...	68,754	18,442	11,619	3,455	2,004
Copra cake ...	7,112	3,340	3,810	954	758
Gambier, all kinds ...	1,632	734	784	122	23
Palm kernels ...	9,359	4,302	5,172	710	785
Palm oil ...	54,377	25,570	22,149	4,971	4,211
Pineapples, canned ...	73,168	42,698	46,695	9,009	8,207
Rubber¶ ...	360,898¶	203,242¶	153,089¶	37,793¶	22,208¶
Sago,—flour ...	4,537	1,687	4,047	532*	919
„ —pearl ...	4,203	1,939	1,773	240	226
„ —raw ...	5,088*	3,046*	2,305*	279*	364*
Tapioca,—flake ...	981	478	521	95	67
„ —flour ...	3,072*	2,087*	1,561*	447*	210*
„ —pearl ...	17,818	8,345	8,279	1,597	1,318
Derris (tuba root) ...	676	207	646	52	66
†Copra equivalent ...	150,944	53,996	58,683	9,706	10,297

† hundreds in number.

* net imports.

¶ production.

MALAYAN AGRICULTURAL EXPORTS, JULY, 1939.

PRODUCT	Net Exports in Tons				
	Year 1938	Jan /July 1938	Jan./July 1939	July 1938	July 1939
Arecanuts ...	33,769	23,705	21,934	1,446	1,950
Coconuts fresh†† ...	116,743†	61,053†	59,714†	10,584†	10,539†
Coconut oil‡ ...	49,140	24,630	32,971	3,372	4,613
Copra‡ ...	68,754	25,445	16,521	7,001	4,902
Copra cake ...	7,112	4,230	4,659	661	849
Gambier, all kinds ...	1,632	870	987	132	103
Palm kernels ...	9,359	4,842	5,772	540	600
Palm oil ...	54,377	29,278	28,415	3,708	5,767
Pineapples, canned ...	73,166	49,689	54,624	6,989	7,929
Rubber¶ ...	360,896¶	231,134¶	189,835¶	27,829¶	36,746¶
Sago,—flour ...	4,537	2,672	3,745	986	302*
„ —pearl ...	4,209	2,318	2,040	380	267
„ —raw ...	5,088*	3,240*	2,713*	193*	408*
Tapioca,—flake ...	981	514	549	36	28
„ —flour ...	3,072*	2,174*	1,574*	87*	13*
„ —pearl ...	17,818	10,009	9,744	1,364	1,465
Derris ...	676	284	658	69	12
† Copra equivalent ...	150,944	66,689	71,292	12,691	12,609

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS
(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,123.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
Total ...	16,003.1	14,977.8	30,980.9	2,872.9	2,469.1	5,342.0
Total January to July, 1938 ...	14,417.1	11,128.1	25,545.2	2,596.0	1,871.0	4,467.0
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 31st July, 1939, were: palm oil 7,711 tons, palm kernels 647 tons.

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 31ST JULY, 1939.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Age of (3) to (2) (4)	Percent- age of (3) to (2) (4)	Age of (5) to (2) (6)	Percent- age of (5) to (2) (6)	Average (11)	Percent- age of (11) to (2) (12)	Age of (13) to (2) (14)	Percent- age of (13) to (2) (14)
		Acres (3)	Percent- age of (3) to (2) (4)	Acres (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	42,993	814	1.9	14,210	33.0					27,909	65.1	7,736	18.0
Malacca ...	118,728	5,516	4.6	35,590	30.0					77,322	65.4	24,267	20.4
Penang ...	2,505	nil	nil	1,126	45.0					1,379	55.0	60	2.4
Singapore ...	31,929	5,260	16.5	9,939	31.1					16,730	52.4	3,536	11.1
Total S.S. ...	196,155	11,590	5.9	60,865	31.0					123,700	63.1	35,619	18.2
F. M. S.—													
Perak ...	284,405	13,200	4.6	73,298	25.8					197,907	69.6	48,924	17.2
Kedah ...	316,646	9,314	2.9	73,685	23.3					233,647	73.8	52,838	16.7
Negri Sembilan ...	262,354	12,549	4.8	75,687	28.8					174,118	66.4	39,002	14.9
Pahang ...	35,869	4,384	5.1	26,314	30.6					55,171	64.3	10,434	12.2
Total F.M.S. ...	949,274	39,447	4.2	248,984	26.2					660,843	69.6	151,198	15.9
U. M. S.—													
Johore ...	478,621	20,022	4.2	149,082	31.1					309,517	64.7	60,631	12.7
Kedah ...	198,339	9,719	4.9	29,954	15.1					158,666	80.0	43,381	21.9
Kelantan ...	31,408	403	1.3	6,976	22.2					24,029	76.5	5,580	17.8
Trengganu (d) ...	4,817	nil	nil	42	0.9					4,775	99.1	2,301	47.8
Perlis (e) ...	1,459	380	26.0	341	23.4					738	50.6	394	27.0
Brunei ...	5,918	nil	nil	2,109	35.6					3,809	64.4	1,331	22.5
Total U.M.S. ...	720,562	30,524	4.2	188,504	26.2					501,534	69.6	113,618	15.8
Total MALAYA ...	1,865,991	81,561	4.4	498,353	26.7					1,286,077	68.9	300,435	16.1

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th June, 1939.

MALAYAN RUBBER STATISTICS Table 1.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF JULY, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over			Production by Estates of less than 100 acres estimated 2			Imports			Exports including re-exports during the month			Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1939	during the month	Jan. to July 1939	during the month	Jan. to July 1939	From Foreign	From Malay States & Labuan	From Jan. to July 1939	Foreign	Local	Foreign	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1939
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES:—																				
Federated Malay States	...	3,722	27,200	10,857	67,159	7,906	28,510	Nil	Nil	Nil	Nil	11,901	7,273	76,534	20,146	...	5,117	25,372	22	191
Johore	...	1,482	10,480	4,576	29,773	4,623	18,664	Nil	63	Nil	333	2,914	6,665	17,735	31,578	...	2,168	9,459	...	...
Kedah	...	110	5,753	2,848	16,720	1,232	4,911	Nil	Nil	Nil	Nil	1,832	2,351	10,064	11,791	...	281	5,529	...	...
Perlis	30	14	63	36	141	Nil	Nil	Nil	Nil	Nil	Nil	Nil	202	...	18	27	...	...
Kelantan	...	435	781	359	2,132	1,012	3,825	Nil	Nil	Nil	Nil	170	1,217	1,770	4,075	...	520	680	...	...
Trengganu	...	Nil	420	151	917	443	1,550	Nil	Nil	Nil	Nil	Nil	651	Nil	2,444	...	30	333	...	...
Brunei	...	Nil	80	45	251	72	389	...	...	...	...	...	104	...	647	...	10	83	...	...
Total Malay States	...	5,752	44,744	18,850	117,015	15,374	57,990	Nil	63	Nil	333	16,817	18,299	105,113	70,878	...	8,162	41,483	22	121
S. SETTLEMENTS:—																				
Malacca	...	1,124	2,444	974	6,387	643	3,311	Nil	Nil	Nil	Nil	1,986	...	14,159	...	...	1,504	2,261	...	...
Province Wellesley	...	503	994	441	2,467	197	1,036	Nil	...	Nil	...	6,914	...	38,805	...	...	1,225	991	...	...
Penang	...	800	2,516	12	21	111	455	3,358	15,066	17,062	69,318	20,245	...	Nil	...	1,428	3,239	19	...	...
Singapore	...	4,740	11,529	249	111	713	285	16,614	...	85,847	...	Nil	...	133,973	...	4,310	18,083	285	25	185
Labuan	...	12	Nil	Nil	Nil	15	65	80	...	376	...	Nil	...	Nil	...	...	18	Nil	...	...
Total Straits Settlements	...	5,540	15,084	3,699	1,547	9,578	5,152	20,052	15,066	103,285	69,318	29,145	...	186,973	...	5,738	24,071	3,556	25	185
Total Malaya	...	5,540	21,436	48,443	20,397	126,693	16,349	63,142	15,129	103,285	69,651	45,562	18,299	293,050	70,878	5,738	32,233	15,039	47	306

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	Singapore	Province Wellesley	Province Wellesley	Province Wellesley
22	23	24	25	26	27
DRY RUBBER	4,429	17,592	3,019	2,299	1,819
WET RUBBER	688	492	220	358	867
TOTAL	5,117	18,085	3,239	2,757	2,186

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to July 1939
Singapore	30	31
Penang	30	31
Port Swettenham	30	31
Malacca	30	31
MALAYA	48	073

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to July 1939
Malay States	32	34
Straits Settlements	32	34
MALAYA	32	34

- Notes:—**
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, i.e., Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] - [21] - [22] - [23] - [24] - [25] - [26] - [27] - [28] - [29] - [30] - [31] - [32] - [33] - [34] - [35] - [36] - [37] - [38] - [39] - [40] - [41] - [42] - [43] - [44] - [45] - [46] - [47] - [48] - [49] - [50] - [51] - [52] - [53] - [54] - [55] - [56] - [57] - [58] - [59] - [60] - [61] - [62] - [63] - [64] - [65] - [66] - [67] - [68] - [69] - [70] - [71] - [72] - [73] - [74] - [75] - [76] - [77] - [78] - [79] - [80] - [81] - [82] - [83] - [84] - [85] - [86] - [87] - [88] - [89] - [90] - [91] - [92] - [93] - [94] - [95] - [96] - [97] - [98] - [99] - [100]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40% stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd August, 1939.

METEOROLOGICAL SUMMARY. MALAYA, JULY, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.			
	Means of		Absolute Extremes				At 1 foot	At 4 feet	Total.		Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.
			Mean of A and B	Highest	Lowest	Min.						Max.	Precipitation .01 in or more	Thunder-storm	Fog morning obs.				Gale force 8 or more
	A.	B.	Min.	°F	°F	°F	°F	°F	in.	mm.	Amt.	Precipitation .01 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor	92.3	71.9	82.1	95	68	87	74	84.3	85.0	0.41	8	5	3	1	1	251.65	8.12	66
Bukit Jeram, Selangor	90.6	72.9	81.7	93	70	86	75	86.8	87.5	2.20	5	4	—	—	2	286.10	9.23	75
Sitiawan, Perak	91.5	72.2	81.8	94	70	88	74	84.8	85.2	1.67	7	6	4	—	—	250.35	8.07	66
Ipoh Aerodrome, Perak	92.0	71.5	81.7	96	68	87	74	84.3	84.5	2.31	5	4	5	—	—	236.90	7.64	62
Temerloh, Pahang	91.4	71.5	81.5	95	69	85	75	85.7	86.4	1.10	5	5	2	9	—	243.00	7.84	64
Kuala Lipis, Pahang	91.0	70.6	80.8	95	68	85	75	83.8	84.6	3.63	5	5	4	29	1	220.40	7.11	58
Kuala Pahang, Pahang	88.3	74.8	81.5	91	71	83	79	88.0	87.7	3.07	9	7	1	2	2	253.75	8.19	67
Kallang Aerodrome, S'pore	86.8	76.6	81.7	89	72	81	82	83.2	84.1	3.76	16	15	3	1	2	207.20	6.68	55
Bayan Lepas Aerodrome Penang	87.8	73.6	80.7	91	71	82	77	84.5	85.0	8.96	15	11	5	—	—	235.95	7.61	62
Malacca Town, Malacca	86.4	74.3	80.3	89	70	82	80	85.5	85.7	6.73	9	8	3	—	2	257.75	8.31	68
Kluang, Johore	89.7	70.9	80.3	93	68	82	73	82.2	82.9	1.50	11	8	3	12	—	219.50	7.08	58
Mersing, Johore	88.9	72.1	80.5	92	69	82	75	83.4	83.3	5.64	10	8	6	—	2	252.10	8.13	67
Alor Star, Kedah	88.1	73.8	80.9	90	70	84	76	84.8	85.6	6.13	12	10	—	—	1	223.05	7.21	58
Kota Bahru, Kelantan	89.8	72.9	81.3	93	69	85	75	85.0	85.2	2.86	10	9	2	2	1	234.05	7.55	61
Kuala Trengganu, Trengganu	88.9	73.6	81.3	91	70	84	77	84.7	85.3	1.76	8	6	6	7	—	233.95	7.55	61
Labuan	88.4	77.6	83.0	91	72	85	81	87.1	87.5	10.43	7	6	3	—	—	262.20	8.46	68
HILL STATIONS.																		
Fraser's Hill, Pahang 4268 ft	75.7	63.2	69.5	79	60	70	65	72.5	72.7	1.05	10	6	3	3	1	246.25	7.94	65
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.8	53.7	63.3	76	45	66	62	69.7	69.6	3.04	8	8	2	3	—	193.30	6.23	50
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	72.5	59.2	65.9	77	58	64	60	*	*	2.78	9	8	—	—	5	206.75	6.67	54

* Not recorded.

Compiled from Returns supplied by the Meteorological Branch, Malaya.

THE
Malayan Agricultural Journal.

OCTOBER, 1939

EDITORIAL.

**The School of
Agriculture, Malaya.**

It is not often realized that the School of Agriculture, Malaya, is the culmination of a proposal originally put forward as far back as 1912. An article in this number traces developments from that time up to 1931, when the School opened its doors for the first time, and proceeds to explain the considerations which led to the adoption of the policy now governing its operation.

Malaya is primarily an agricultural country and the probability is that it will always remain so. Here as elsewhere, the application of science to agriculture is requiring an increasing standard of technical knowledge on the part of those who practise this mode of life. As a result, it is obvious that local agricultural education is a matter of fundamental importance to the successful development of this country.

The article shows that there are in the main three forms of occupation open to students who have successfully completed one or other of the two courses at the School. Government service and semi-official employment such as is provided by the Rubber Research Institute of Malaya have up to the present absorbed the greatest proportion of those students whose histories since leaving the School are known. The next largest group consists of those students who have failed to keep in touch with the School and who presumably have in the majority of cases returned to the *kampung* or other family property to become small-holders or managers, while the smallest group consists of those students who are known to have found salaried employment in commercial enterprises, such as estates. It is pointed out that the major difficulty in increasing the proportion of this last group lies in the fact that, while the majority of estates in this country are operated by South Indian or Chinese labour forces and the normal estate preference is for conductors to be of the same race as the labourers in their charge, students of these nationalities who ultimately have in view estate employment have not up to the present been forthcoming in adequate numbers to satisfy the known demand.

The article also refers to an interesting attempt that is being made to determine if it is possible to encourage and fit selected Malay students for estate employment, and it concludes with a picture of student life at the School.

Rat Control. Rats are a menace in Malaya, as in most other countries, and although the economic losses they occasion here are not known with any degree of accuracy, they are undoubtedly very serious. These rodents attack growing crops and either consume or spoil stored agricultural products such as rice. In addition, they are the vehicles of several formidable diseases of humans, such as tropical typhus, leptospirosis, plague, melioidosis and rat-bite fever, and are also hostile to animals such as pigs and to poultry.

Local readers of this Journal will need no reminding of the very energetic measures that have been adopted in some districts to minimize rat damage in the case of the padi crop, and an article in this number describes the various rat-control measures practised by local oil palm estates. Rats frequently cause considerable damage on such estates, since they may attack the palm during all stages of its growth and may lead to serious diminution in production of oil and kernels, and they are best controlled by a combination of preventive and exterminative measures. The chief preventive measure consists of modifying or removing estate conditions which provide harbourage or protected breeding places. On some estates, for example, it has been found that the removal of jungle timber and of dense cover crops has contributed materially to a reduction of the rat population.

The exterminative measures practised at the present time on oil palm estates are: hunting with dogs, trapping, poisoning and the establishment of cat farms. Considered individually these measures are of varying applicability and utility. The rat is a cautious and intelligent animal and gradually becomes accustomed to certain control measures, hence the best results are normally secured by employing a variety of such measures, either concurrently or in rotation. It has been authoritatively stated, too, that under very favourable conditions the rate of multiplication of rats is such that a single pair may increase to almost nine hundred living descendants at the end of a year. The significance of this characteristic in control work, and of the potential migratory habit of rats, is that the measures adopted are found to be most effective when they are applied in a sustained and systematic manner over fairly wide areas. Spasmodic measures are usually a waste both of time and money.

Original Articles.

THE SCHOOL OF AGRICULTURE, MALAYA,

BY

G. E. MANN, M.C.

Principal, School of Agriculture, Malaya.

The School of Agriculture, Malaya, was opened in May, 1931. It is situated at Serdang, about 14 miles from Kuala Lumpur, and adjoins the Central Experiment Station of the Department of Agriculture, Straits Settlements and Federated Malay States. The main building includes four class rooms, two laboratories, library, museum, staff common room, offices and store-rooms. The hostel, in which all students are required to reside during term, comprises four dormitories with modern sanitation, dining hall and kitchens, and students' common room. The School can accommodate 80 students. Two courses of instruction are given. The major course, lasting two years, is conducted in English and provides a training in the theory and practice of tropical agriculture with special reference to Malayan conditions. Applicants are normally required to have passed at least the Cambridge Junior Local examination. The minor course, lasting one year, is conducted in Malay, and class work follows more elementary lines appropriate to the lower educational standard of students who have either not attended a secondary school at all or who have succeeded in reaching only Standard V therein.

The School is owned and maintained jointly by the Governments of the Federated Malay States and Straits Settlements, the latter contributing 22 per cent. of the cost—an arrangement based on the relative acreages alienated for agriculture up to 1930. The capital cost, including staff quarters and various outbuildings, was about \$264,000; while maintenance, including staff salaries, is about \$45,000 per annum.*

Before proceeding to a detailed description of the School, an account may be given of the events leading up to its inception. This ante-natal history is not only interesting but goes back considerably further than many residents in Malaya realize.

Early in 1912, the then Chief Secretary to Government, F.M.S., (Sir E. L. Brockman) put forward proposals regarding the training of agricultural students by the Department of Agriculture. These proposals were immediately overshadowed by others originating from almost the opposite side of the globe. In a memorandum dated 23rd May, 1912, Sir (then Dr.) Francis Watts, Commissioner of Agriculture, West Indies, submitted to the Colonial Office a proposal for the

* \$1 (Straits) = 2s. 4d.

Note.—The above article was written primarily at the request of the Editor of *Oversea Education* for publication in that periodical (which is published at the Colonial Office for the Secretary of State for the Colonies) and he has approved publication also in the *Malayan Agricultural Journal*. A slightly abridged version of the article was published in *Oversea Education*.

creation, somewhere in the British tropics, of an Agricultural College and Institute of Tropical Agricultural Research, to be regarded as serving not merely the colony in which it was established but to have regard to wide tropical interests embracing, if necessary, the whole range of the world's tropical concerns. Such an institution, Sir Francis suggested, might serve to afford the education and training required by students who were to undertake the work of planters, thus training the men who would ultimately be in charge of tropical agricultural enterprises; to give training in the special problems presented by the tropics relating to agriculture and allied subjects in connexion with such special studies as entomology, mycology, agricultural chemistry and soil problems, the object being to complete the training, so far as tropical considerations were concerned, of the specialists required in these branches of work throughout the tropics; and finally to afford facilities for advanced study, research and experiment in connexion with agriculture and plant problems, in the wide ranges including plant physiology and plant breeding and the problems underlying the production of crops. In this direction, the proposed institution was to form a corollary to schools of agricultural research in Great Britain and would usefully enlarge their outlook.

Sir Francis suggested Trinidad as the most suitable home for the College. The Secretary of State for the Colonies, however, was evidently not prepared to accept Trinidad off-hand. He submitted the memorandum to the High Commissioner, Malay States, who consulted the Rulers and Members of Council as to the possibility of locating the College in the Federated Malay States. On the whole, the suggestion met with a favourable reception; one or two people thought that Ceylon would be a better choice but only one Member of Council voiced any decided opposition. He considered that, if a College of Agriculture were established in the F.M.S., the greatest demand for places would come from local Asiatics but that posts carrying salaries commensurate with the qualifications of graduates would not be forthcoming for them.

In reporting to the Secretary of State, the High Commissioner (Sir Arthur Young) welcomed the scheme but asked for estimates as to its cost. Meanwhile, early in 1914, a local committee was appointed to consider the proposals in detail. The then Director of Agriculture (Mr. Lewton Brain) expressed his opinion that, if the College were eventually to train both Europeans and Asiatics, it would be easier to add Asiatics on to Europeans than *vice-versa*; and that, for native education, it would be preferable to start from the bottom, teaching small-holders by demonstrations and visits to their holdings, by starting school gardens and perhaps later on by opening one or two agricultural schools. He believed that existing colleges in England could already turn out as good, or nearly as good, estate managers as could a college in Malaya and he therefore doubted whether the extra expense involved by a preliminary training in this country would be justifiable. If a College were to be established in Malaya, it should be primarily a research institution, supplementing the work of the Department of Agriculture.

In June, 1914, the committee reported unanimously that, in the first instance, a local School of Agriculture was desirable but that it should aim at training natives and other inhabitants of the country, Asiatic landed proprietors, village headmen, native subordinates of the Agricultural and kindred Departments, and conductors and native assistants on estates. In other words, the committee recommended the creation of a technical school the scope of which might be expanded later on by including a measure of research work.

Then came the European War with all its financial and other difficulties, and, so far as Malaya was concerned, the proposals for an Agricultural College had to be shelved. Trinidad thus came back into the picture; the West Indian Agricultural College was established there in 1921 and, in 1924, it became the Imperial College of Tropical Agriculture.

From 1914 to 1924 various attempts were made to revive interest in a Malayan School of Agriculture but no material progress was made, again owing to financial difficulties. Prior to 1924, junior Asiatic officers in the Department of Agriculture, S.S. & F.M.S., were attached individually, for purposes of training; to senior officers either at headquarters or in the field. The system had certain defects, one of which was that recruits (none of whom had any previous scientific education) tended to receive a somewhat unbalanced training. In 1924, therefore, a small departmental school was opened in a semi-permanent building at headquarters with accommodation for two classes of 10 students each. One European and one senior Malay Officer were detailed as instructors, and a modest but definite syllabus was introduced, covering a period of two years. Little practical field work was possible and the School made a rather shaky start in some ways, but it eventually settled down and, in fact, proved quite a success in a limited way.

Public opinion became more insistent about this time and, in 1927, an advisory committee was appointed by Government to draw up a scheme for a School of Agriculture as a joint institution for the Federated Malay States and Straits Settlements. This committee recommended that the purpose of the School should be to provide adequate agricultural training for apprentices in the Department of Agriculture and possibly other Departments and for such private students as might be forthcoming. Two courses of training were envisaged—a three year course in the principles and practice of scientific agriculture and a two year practical course with special reference to the major crops of the Peninsula. Proposals relating to staff and buildings were drawn up and work was begun on the preparation of a 22 acre site at the Government Experimental Plantation (now known as the Central Experiment Station) at Serdang. Special expenditure was voted by the F.M.S. & S.S. Governments in the 1929 to 1931 estimates and the construction of buildings was begun in 1930. Meanwhile, with the advent of Dr. H. A. Tempany as Director of Agriculture, the advisory committee changed the proposed minor course to a one year course in the vernacular, designed partly to provide training for departmental subordinates and partly as a possible forerunner of a chain of farm schools throughout the Peninsula. Rapid progress was made in every respect about this time and the School was formally opened in May 1931, just before another serious financial depression set in.

So much for the ante-natal history of the School of Agriculture, Malaya, which thus extends over a period of some nineteen years. This long time, however, can in no way be attributed to apathy; nor did it fail to have its compensations in certain directions. For example, when the School did eventually open its doors, its objects had been crystallized and the staff was able to concentrate on a more definite programme than might otherwise have been possible. These objects were, in fact, threefold: (a) the training of Asiatic recruits for junior and subordinate appointments in the Department of Agriculture; (b) the training of Asiatics for salaried employment on estates, in private companies dealing with agricultural requirements such as fertilizers, and in the comparatively new Rubber Research Institute of Malaya, the extension work of which was soon to be expanded considerably in order to reach all rubber planters and not merely the larger estates, through a staff of Asiatic Rubber Instructors; and (c) the encouragement of new crops and particularly improved methods of cultivation on small holdings, through students who returned to their homes on leaving the School.

Clear-cut as these objectives are, they involve one difficulty in that the large majority of students at the School—at any rate since its first year or so of operation—have no precise idea as to where they will find employment until they have completed their training at the School. They have made up their minds to adopt agriculture as a career but, with few exceptions, they cannot be directed from the beginning to any particular outlet because vacancies may not exist at the time and, when they do occur, they need to be filled by selection based on the merits as well as the personal outlook of the various candidates. For this reason, and for reasons of economy as well, general rather than specialized courses of training are inevitable. With this qualification the major course is suitable for English-speaking students who hope to enter the Department of Agriculture or the Rubber Research Institute or who contemplate managing small estates or working as conductors on large estates, while the minor course is designed for non-English-speaking students who hope to gain subordinate appointments in Government service or who propose to return to small holdings owned by relatives or friends who are progressive enough to see possibilities in new crops or improved standards of husbandry. Students are therefore advised not to consider themselves as finished products when they leave the School but to regard themselves with a certain degree of humility as being, for a time, mere apprentices. In Government service and the Rubber Research Institute, junior officers recruited straight from the School are normally given a few months' *ad hoc* training by specialists to fit them for their particular duties. Estate managers in general also appreciate the circumstances and they usually arrange that any student who comes straight from the School is engaged on a short period of probation during which the employee has a fair opportunity of learning to handle labour and of adapting himself generally to estate conditions. If the young man shews promise, he is then offered a definite agreement with provision for annual increments of salary for some few years, after which the employee can be expected to bargain for himself and seek more lucrative and congenial employment elsewhere if he so wishes.

The acid test as to whether this policy is sound is to be found in the number of students (particularly private students) admitted each year and the number of salaried posts which they have secured. The School opened with 37 boys of whom only three taking the major course were private students. Numbers fell to 30 in 1932 owing to the widespread financial depression, and two important changes were therefore introduced. The first of these consisted in shortening the major course from three to two years, thus reducing the cost both to Government and to private students. The second involved the suspension (so far as the Colony and the F.M.S. were concerned) of the system of recruiting departmental apprentices as such and the substitution of a Government scholarship scheme involving no guarantee of subsequent employment. The number of students rose to 53 in 1933, 69 in 1934, 76 in 1935 and 80 in 1936. The latter two years were exceptional in that the Unfederated Malay States were making considerable use of the School in building up a larger staff of junior and subordinate officers. The change from a three year to a two year course had the opposite effect in that it naturally tended to a falling off in the number of students at the School, for one complete class had been lost. Numbers consequently declined to 68 in 1937 and 59 in 1938, but have risen in 1939 to 66. The corresponding numbers of private students admitted to the major course are 3, 3, 6, 9, 11, 12, 9, 11 and 8.

These last figures include only those boys who have completed or are now taking the major course; they do not include those who—for one reason or another—have left the School before completing the course, and they do not indicate the fact that—for the past few years—the number of applications for admission have been considerably in excess of the number of vacancies. Classes originally designed for 20 students are now required to accommodate 25 and, allowing for two major classes of 25 and one minor class of 15, the normal strength of the School may now be expected to be from 60 to 65 students, depending on wastage.

Turning now to the subject of employment, we find that of 256 students who have completed a course of training at the School, 189 are known to have found salaried employment. The true figure is almost certainly higher as some students have failed to keep in touch with the School, and their present occupations, if any, are unknown. Details of these 189 employees are as follows—

		Major Course	Minor Course
Dept. of Agriculture, S.S. & F.M.S.	...	22	39
-do- U.M.S.	...	8	48
Other Departments of Agriculture	...	2	1
Other Government Departments	...	5	5
Rubber Research Institute	...	39	0
Commercial enterprises	...	18	2
		—	—
Total	...	94	95
		—	—

It will be observed that only 20 boys have so far been absorbed into commercial enterprises such as estates. The reason for this lies not so much in a lack of demand on the part of estate managers as in the fact that many students have so far been able to secure more attractive appointments in Government service and the Rubber Research Institute, an advantage which will largely disappear as staffs become complete and new recruits are required only for replacing casualties.

While on the subject of estate employment, mention may be made of the rather peculiar position of Malay students. Practically all estates in Malaya are operated with either Chinese or South-Indian labour, supervised by conductors of the same race, and there exists a certain diffidence on the part of Malays to compete for such posts, while not a few experienced planters consider that Malays would be incapable of controlling a labour force of Indians or Chinese. One can understand these feelings up to a point. Any attempt to replace Chinese conductors by Malays would almost certainly be doomed to failure and any large-scale effort to replace Indian conductors would probably be equally futile and is in any case not contemplated. But one has yet to be convinced that Malays cannot be found who possess the necessary specialized characteristics and would settle down and make perfectly satisfactory estate conductors. They would naturally need more than a mere knowledge of the language; they would need to understand the life and customs of the labour force. But such knowledge can be acquired and there is at least a *prima facie* case for believing that Malays can be found who would rather work on an estate than remain idle. Provision has therefore been made recently by Government whereby selected Malay students at the School are taught colloquial Tamil and may, on completing the major course, be granted continuation scholarships and paid apprenticeships to enable them to acquire a sound knowledge not only of the language and customs of Tamil labourers but also of estate routine. The experiment has not been in operation long enough to indicate whether it will eventually succeed or fail, and it may take as much as ten years to decide one way or the other.

Something may now be said about the detailed working of the School. The present teaching staff consists of the Principal and Vice-Principal (both Europeans), an Assistant Lecturer (Chinese), a Junior Lecturer (Malay), and two Agricultural Assistants (both Malays). Class work ordinarily occupies $15\frac{1}{2}$ hours and field work 18 hours a week. The usual day's programme consists of field work at the School from 6.30 to 8.30 a.m., lectures and laboratory work from 9.30 a.m. to 1.30 p.m. (12 noon on Fridays and Saturdays), and field work again from 4 to 4.30 p.m. For the first period students work communally, either on an area of about 14 acres of rubber (seedlings and budgrafted) or on other practical operations such as weeding, composting, nursery work, spraying and dusting with fungicides and insecticides, and so on. In the afternoon period, which lasts considerably longer, especially when crops are being newly planted, the students cultivate their individual plots—four beds per student, each about 27 feet long by $3\frac{1}{2}$ feet wide and devoted to a rotation of short-maturation vegetable crops. In the course of a year, a student thus gains experience of some ten to twelve quick-growing crops suitable for sale

or for home consumption, and this number can be doubled in the two year course. In all individual work, the necessary seed or other planting material is supplied by the School but students are encouraged to harvest their own produce and to take some of it home with them, the balance being consumed at the School. Senior students are also encouraged to test out their own ideas rather than follow any prescribed routine. In addition to such work, six students each week are detailed for practical instruction in the management of poultry, and a like number for the preparation of smoked rubber sheet from latex; while, towards the end of each calendar year, a whole month is given up exclusively to field work during which special intensive courses are arranged in connexion with such subjects as the bud-grafting of rubber, kiln-drying of copra, and the grafting of fruit trees. Every Tuesday, the whole morning from 6.30 a.m. to 12.30 p.m. is spent at the Central Experiment Station on practical work dealing with the cultivation and processing of the more important crops other than rubber, coconuts and rice; for example, oil palms, tea, coffee, fibre plants, spices, gambier and derris. The students thus cover a wide range of crops during their time at the School. It is to be admitted that practical work on rice cultivation is not possible at Serdang itself, but the large majority of the two year course students do not require this (for the crop is nowhere planted on an estate scale in Malaya) while arrangements can be made periodically for one year course students to spend a few days at a time in some convenient padi area. This is the main distinction drawn in field work between the two courses; the only other noteworthy distinction is that only major students receive training in factory procedure in relation to palm oil and tea manufacture.

In the major course, class work covers an extensive field, considering that it lasts only two years and that few students have had any scientific education before coming to the School. The syllabus comprises Chemistry and Physics, Botany and Mycology, Zoology, Principles of Agriculture, Field Crops, Agricultural Law, Horticultural Technique, Plant Pathology, Animal (including Poultry) Husbandry, Genetics, Estate Sanitation and Hygiene, Estate Records and Reports, Mathematics and Surveying. As far as possible, these subjects are developed in sequence—Science, Agricultural Science, Scientific Agriculture; but this ideal cannot be followed as closely as would be possible in a longer course. In the minor course, the lecture syllabus comprises Nature Study, Animal Study, Principles of Agriculture, Field Crops, Arithmetic, Agricultural Geography and Office Routine—all, of course, in a somewhat elementary way but not so elementary as would probably be found in a Farm School. The latter type of school is essentially a local institution, dealing mainly with the crops and requirements of the immediate surroundings. At Serdang, one year course students come from all parts of the Peninsula and a general rather than a localized training is required. Two Farm Schools have been opened in Malaya, one in Malacca and one in Penang, but they are conducted quite separately from the School at Serdang.

So much for the work of the School. It remains now to say something about more domestic arrangements. Of the four dormitories, two are occupied by Malays, the remainder by Chinese and others. Two menus, Malay and Chinese, are provided, each student getting five meals a day, three of which ("gun-fire," breakfast and tea) are quite light whereas lunch and dinner are comparative feasts. It should be remembered that young and growing lads doing a fair amount of field work have useful appetites. Catering is organized on somewhat complicated lines, not on a simple contract system, and the menus are capable of considerable variation without increasing the cost, which averages from 40 to 42 cents (say 11 pence) a head per diem.

In relation to games and recreations, the School is well equipped. In addition to association football, hockey and cricket, the boys can play tennis, badminton, volley ball and basket ball, while indoor games such as table-tennis, chess and draughts are available in the common room, where newspapers and suitable magazines and scientific periodicals are provided. All recreations are organized by the boys themselves through a Students Union under the control of the Principal assisted by a Games Master, and the four dormitories conveniently provide four houses for internal competitions. These houses are known as Watts, Hooker, Morris and Harrison, familiar names in the history of agricultural development in the British tropics. Games, however, are a somewhat expensive item, for there are comparatively few students. Government provides a sum of \$225 (say £25) a year, but the students themselves have to contribute from \$1.50 to \$5 a year per head in order to keep everything going.

In relation to discipline, the regulations allow the students considerable freedom. Thus, the hostel is not locked at night; anyone may have leave till 11 p.m. but is required to report to a prefect when he returns. Week-end leave from mid-day Saturday until Sunday night is granted to anyone who wants it so long as his conduct and field work have been satisfactory. Serious breaches of discipline are very rare and punishments are seldom necessary. If a boy cannot respond to a few cautions, he is usually of the type that will not respond to anything; he makes poor progress and is sooner or later withdrawn from the School by his parents. In at least one respect, schoolboys in Malaya are no different from schoolboys elsewhere. They like their "bit of fun" and the majority do not work harder than is necessary. On the whole, students at Serdang give remarkably little trouble and it is seldom necessary to "lay down the law."

In conclusion, it may justly be claimed that the School is supplying what the country requires. It would probably be better balanced if more South-Indian students were forthcoming in order to supply the demand for conductors on estates, but neither Government nor the School itself is responsible for the present lack of support and the value of the School may be more appreciated by Indians as time passes. There would appear to be no need at present for any higher form of agricultural training in Malaya. It is true that, during the past few years, a new trend of organization has become evident whereby groups of estates are now employing

their own scientific officers for various lines of research; but enquiries made by the School from the larger estate agency houses indicate that, while there is likely to be a steadily increasing demand for students who have taken the two year course, the demand for more highly trained Asiatics would be too small to justify a policy of encouraging students to proceed to a University or similar institution on leaving the School. So far as the present and immediate future are concerned, the principal need is that students taking the major course should have had at least an elementary scientific education before entering the School. Indications are that conditions will improve in this respect in the near future and the staff will then be free to make even better use than now of the material at its disposal.

Received for publication 15th July, 1939.

THE RURAL LECTURE CARAVAN

BY

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Co-operative Marketing Officer, F.M.S. and S.S.

Two previous articles have been published* describing the construction and fittings of the Rural Lecture Caravan, which is run jointly by the Department of Agriculture, the Rubber Research Institute of Malaya, and the Co-operative Societies Department. These articles also contained accounts of the objects for which the Caravan is maintained and the methods of working used during the period 1930 to 1936.

The original caravan met with an untimely end, owing to an accident which occurred on January 3rd, 1938, on the Seremban-Tampin Road, when it skidded and hit the root of a rubber tree, afterwards overturning in the road. The body-work of the Caravan was smashed and the chassis badly damaged, though fortunately the driver and the cinema operator escaped serious injury.

The total mileage covered by the Caravan prior to the accident was approximately 42,000 miles.

Extensive repairs were necessary to the Kodascope film projector and to the amplifier equipment, and most of the lantern slides and agricultural exhibits were destroyed. A sum of \$1,574 was received from the insurance company and the Government Factory took over the chassis of the dismantled wreck at a valuation of \$150.

Construction of New Rural Lecture Caravan.

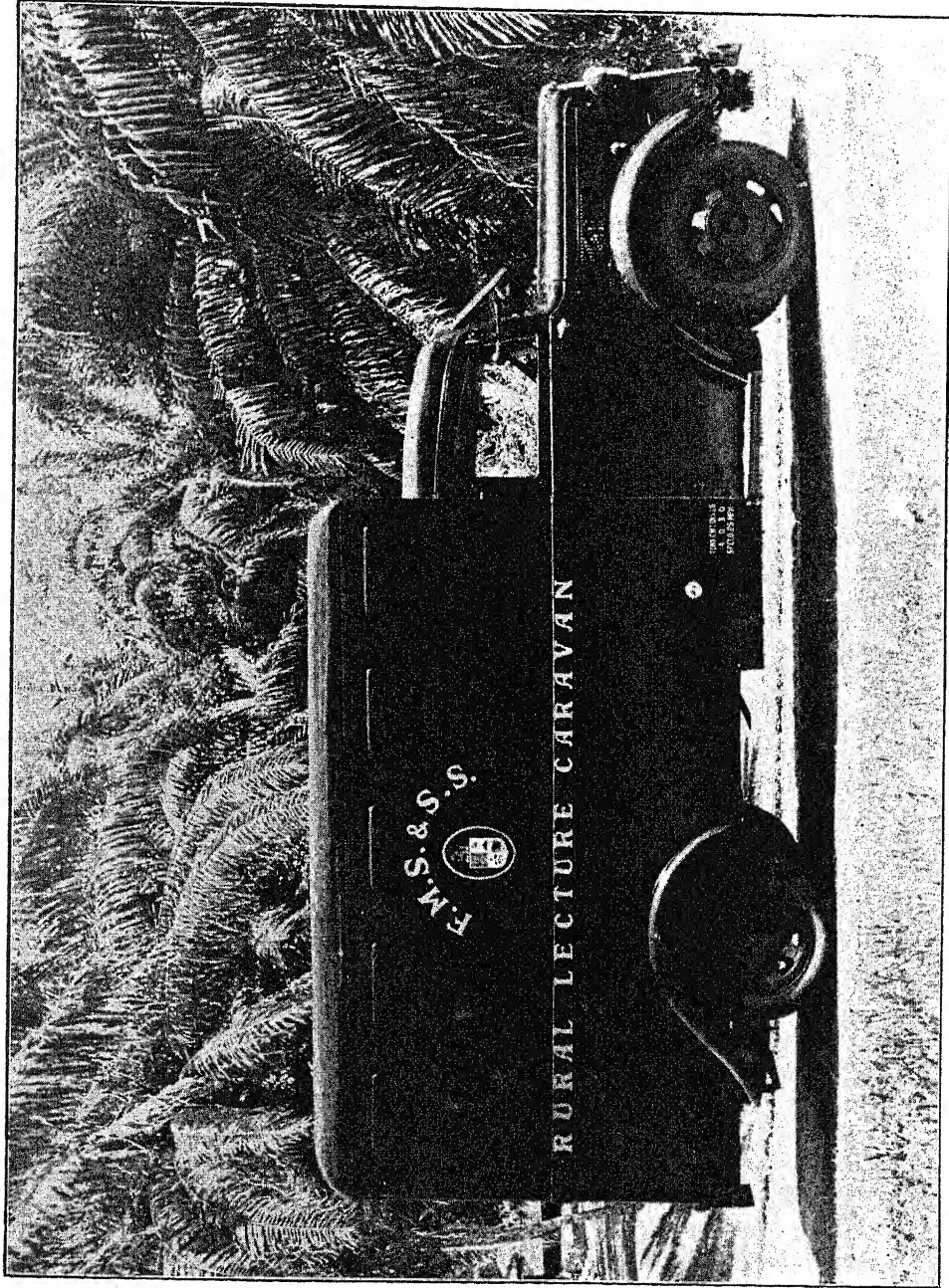
A sub-committee was formed consisting of members of the Department of Agriculture, Rubber Research Institute and Co-operative Societies Department, and this Committee was charged to make enquiries regarding the cost of a new Rural Lecture Caravan and to consider its design and equipment.

Pending the construction of a new Caravan, a covered van was lent by the Government Factory to carry on the normal instructional tours.

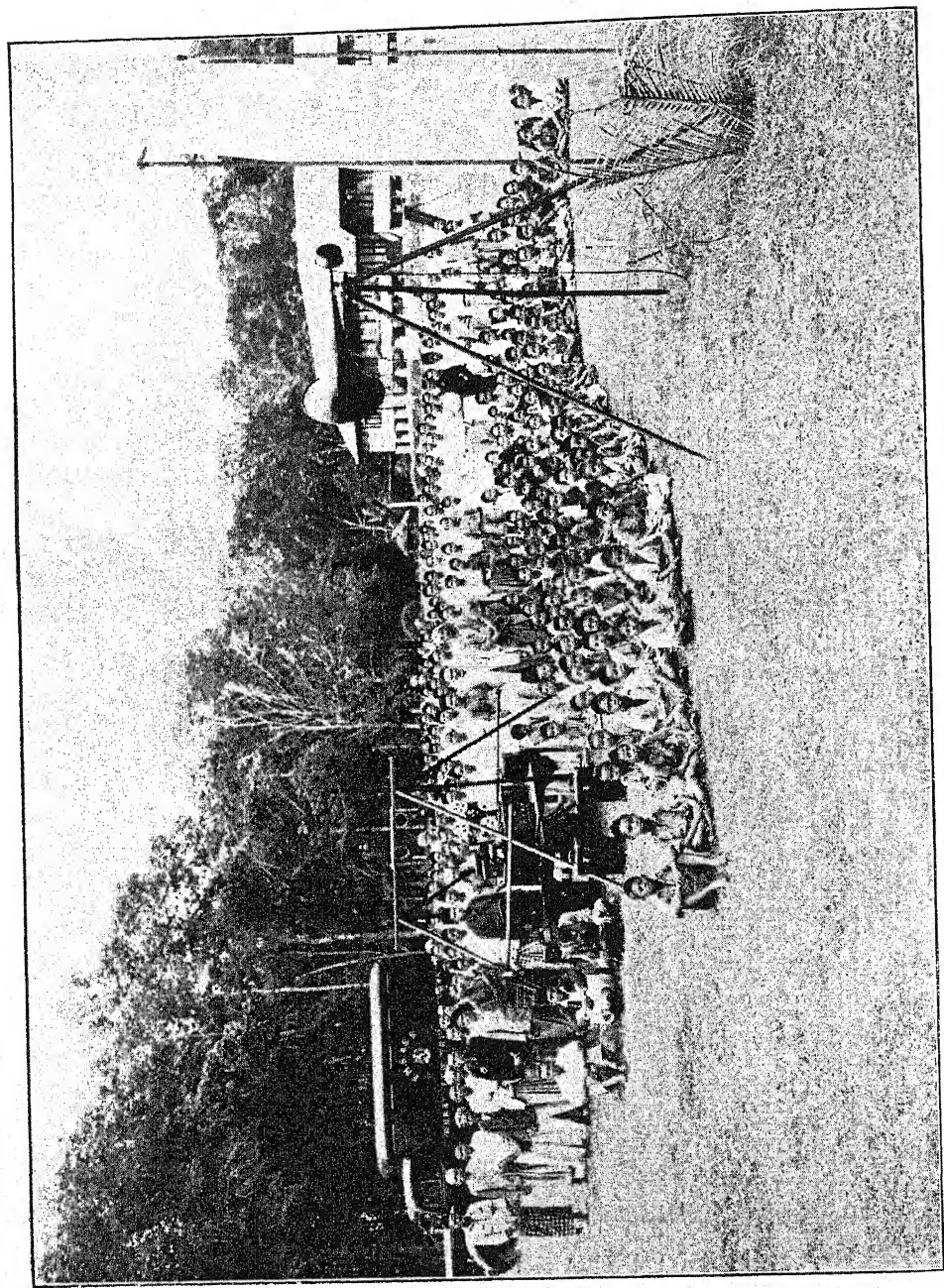
When considering the design of the new caravan, the sub-committee made every effort to obviate the repetition of certain drawbacks which experience had brought to light in the construction of the old caravan. These drawbacks were, in brief, as follows:—

- (i) The old vehicle was cramped for space in respect of all dimensions.
- (ii) In the early stages, a considerable amount of the equipment was carried in a trailer. Experience proved that this was not a satisfactory procedure and arrangements had to be made for this equipment to be carried in the

* *Malayan Agricultural Journal*, Vol. XIX, No. 5, May, 1931, and Vol. XXIV, No. 11, November, 1936.



The New Rural Lecture Caravan.



Caravan Equipment in Preparation for an Evening Lecture and Cinema Show.

caravan. Later, additions were made to the extra equipment formerly carried in the caravan and proper stowage of this material proved difficult.

- (iii) The body-work of the old caravan was of a very heavy type, wood paneling being used in walls and roof.
- (iv) The interior of the caravan was dark owing to difficulty experienced at the time of its construction in obtaining a satisfactory type of white paint.

The Committee found that a 30 cwt. chassis would be suitable for the new Caravan, that sleeping accommodation was not necessary, that there should be 6 ft. head space in the bodywork and that twin rear wheels should be fitted. The Government Factory quoted \$3,700 for the complete vehicle, which, taking into account the amount recovered from the insurance company, left a sum of \$1,976 to be found by the three joint owners concerned.

Chassis. A chassis of the latest Morris 30 cwt. commercial C.V.S. long wheel-base 6-cylinder type having a rating of 25 h.p. was purchased by the Government Factory through the Crown Agents to the Colonies.

Bodywork. The framework and flooring of the new Caravan are of *chengal*, and the interior and exterior panelling is of sheet aluminium. The interior is painted white, and exterior panelling is spray-painted in dark and medium green.

The coat-of-arms of the Federated Malay States in true heraldic colours appears on one side of the exterior panelling and that of the Straits Settlements on the other.

The letters "F.M.S. & S.S." surmount the coat-of-arms on each side and below are the words "Rural Lecture Caravan." In the centre of the doors at the back of the Caravan is an inscription in Jawi *Suloh Kemajuan Kehidupan Kampong*. All lettering is in gold, and the vehicle presents a handsome appearance.

Subsidiary flush-fitting tanks are provided underneath the body for the storage of Diesel oil (10 gallons) and lubricating oil (2 gallons) for use with the Diesel engine.

These tanks were fitted as the type of oil used by the Diesel engine is not readily obtainable in many places served by the Caravan.

Special attention was given in the design of the Caravan to ensure that the interior should be light and airy.

Extra large windows were fitted in the back doors and at the rear of the driving cab. The rear windows are adjustable. Ample ventilation is assured by the use of louvres on both sides of the body, just below the roof of the Caravan. There is also a grille behind the driving cab to allow a current of air for cooling the Diesel engine and dynamo. A central roof light is fitted.

The interior measurements of the Caravan are: length 11 ft. 2 ins., width 5 ft. 10 ins., height 6 ft.

Interior Fittings and Equipment.

When designing the interior fittings of the Caravan, it was necessary to arrange for a Diesel engine and a dynamo, 2 Kodascope projectors, a lantern and cinema together with their slides and films, a screen, and the gramophone and amplifier equipment to be safely stowed for transport.

Agricultural and rubber exhibits, the property of the Department of Agriculture and the Rubber Research Institute, include padi samples in glass jars and scale models of the Serdang night-ark for poultry, copra kilns and smoke-houses. There are also numerous framed photographs and diagrams to illustrate various planting methods. Light trestle tables are carried for use when exposing the agricultural exhibits. It was arranged that heavy articles such as projectors, gramophone and amplifier equipment should rest on the floor while cabinets and drawers are provided on both sides of the Caravan for the lighter cinema films, slides and agricultural exhibits.

Centrally placed and just behind the driving cab are the Diesel engine and dynamo, which provide current for the cinema. These are permanently clamped to the chassis frame.

The Diesel engine is comparatively new. The amplifier equipment, which was old-fashioned and costly to use and had not given satisfaction during the last few tours, was replaced by a new public address unit purchased in July 1939, and this is giving every satisfaction.

The new Caravan was put into commission for its first tour at the beginning of February, 1939.

Method of Working.

The tour programmes are arranged by the Department of Agriculture with due respect for the phases of the moon, which, at its full, can kill an outdoor film show.

When on tour in any particular area the Caravan is under the supervision of the local Agricultural Officer, who arranges for lectures to be given by the Malay Agricultural Assistant and the Asiatic Rubber Instructor.

The Malay and Indian Co-operative Officers also give lectures at suitable centres. The normal procedure is for the Caravan to spend 2 days in a place, although this is not invariably the rule.

On arrival at the open space, generally the school play-ground, the agricultural exhibits are laid out for view and explanation, the gramophone with loud-speaker amplification helping to attract a crowd.

Penghulus and Ketuas are asked to preside at lectures and discussions.

A lecture is given by the Malay Agricultural Assistant or Asiatic Rubber Instructor between 5 and 6 p.m. and the cinema usually begins about 7 to 7.30 p.m., lasting till 12 midnight.

A similar procedure is repeated on the second day, but instead of a lecture the Malay Agricultural Assistant or the Asiatic Rubber Instructor is available to answer questions relative to the previous day's lecture.

Before a lecture and during a cinema performance, the gramophone supplies music, Malay and Javanese tunes for a *kampung* audience and Tamil records for an estate performance.

The music is much appreciated by the audience, members of which frequently show their gratification by bringing their own records to be played through the loud speaker.

Tours of the Rural Lecture Caravan.

The new Caravan has now completed four tours, in the following centres:—
1939.

8th-28th February	—	Perak South.
10th-30th March	—	Perak Central
9th-29th April	—	Krian and Perak North.
12th-27th May	—	Ulu Langat and Selangor.

No mechanical trouble has been experienced. Good reports have been received regarding the popularity of the shows at various centres.

Results.

Lectures and cinema performances given in conjunction with tours of the Rural Lecture Caravan have sown the seeds of new ideas in many *kampungs*. Such performances, however, have to be followed up for several months by lecture, demonstration and informal discussion by the local officers of the Department of Agriculture, Rubber Research Institute and Co-operative Societies Department to ensure any lasting betterment. By these means definite results have been achieved by the propaganda of the two Departments and Institute concerned.

The two illustrations show the new Caravan and cinema at work and the agricultural exhibits being explained by a Malay Agricultural Assistant.

Received for publication 27th June, 1939.

RAT CONTROL ON OIL PALM ESTATES

BY

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Introductory.

Rats frequently cause considerable damage on oil palm estates. They may attack the palm during all stages of its growth, eating the buds from the centre of young growing plants and later attacking the fruit bunches and female inflorescences. In the latter cases this may lead to serious diminution in production.

In view, therefore, of the importance of rat control, oil palm estates were circularized and asked to report the measures adopted for this purpose. The present article summarizes the resultant replies and incorporates additional information derived from trials carried out at the Central Experiment Station, Serdang, and abstracted from reports by Departmental Officers on the subject.

Damage to Young Palms.

So far as is known, the destruction of young palms has occurred only on newly-planted areas, where there are no fruiting palms to attack. In such areas, damage is commonly associated with a low-growing cover, climbing over fallen timber and tree stumps, resulting in conditions which provide ideal harbourage and breeding places for the rodents.

It seems likely that rats at first feed on the seeds of the cover plants and that later, when multiplication has increased the population pressure on such food supplies, they commence to attack the soft tissues of the seedlings. Even two-year old palms may thus be attacked, the midribs and leaf-stems being gnawed through causing the leaves to collapse and fall to the ground.

On one large estate where extensive planting was in progress some years ago, expenditure on rat control at this stage amounted to more than \$2 (Straits currency) per acre per annum. All the known methods of destruction detailed later in this article were tried with little apparent effect on the rat population. Eventually the low-growing cover crop, mostly *Centrosema pubescens*, had to be suppressed, while, in addition, cylindrical guards, 6 ins. diameter and 15 ins. high, made of $\frac{1}{2}$ in. mesh wire netting, were placed around each plant in the field. It was also found advisable to retain the seedling palms in the nurseries until they were 18 to 24 months old.

Damage to Fruiting Palms.

At first the rats attack the fruit bunches only, but as soon as they increase sufficiently in numbers they commence, in addition, to devour the freshly or partially opened female inflorescences.

In the case of the bunches, the rats will gnaw only the outside layers of the pericarp, but when they begin to attack the female inflorescences, frequently consuming one-third or even one-half of an inflorescence, a much more serious loss of potential fruit is involved.

It has not been found possible to assess with any degree of accuracy the amount of damage in these two cases. Estimates supplied by estate managers place the damage at 3 to 5 per cent. loss of fruit when only the bunches are attacked and a minimum of 10 per cent. in those cases where both fruit bunches and female inflorescences are seriously involved. Losses of 5 and 10 per cent. of fruit correspond to approximately 1.25 and 2.5 per cent. reductions in output of oil.

Incidence of Attack.

The incidence of attack varies considerably; for example, there are some estates which suffer practically no damage, while other estates are so heavily infested that uninterrupted and stringent methods of control are required. On a heavily infested estate the number of rats destroyed may be as high as 150 per acre per annum.

Rats would appear to have a migratory habit. Thus, on one estate of between 2,000 and 3,000 acres of mature palms on which damage from rats was practically unknown, the latter suddenly made their appearance about the middle of 1938 and in approximately 3 months more than 75,000 rats were destroyed.

This migratory habit is doubtless correlated with food supply, which in turn is related to rate of breeding. Thus, observations in Java showed that, when the padi harvest was over and that particular food supply exhausted, the rats would migrate to neighbouring fields where other crops such as maize, groundnuts and sugar cane were being cultivated. ⁽¹⁾

In the case of the oil palm this migratory habit should not be so marked since fruit is available at all seasons. It is evident, therefore, that on all estates there is need for constant vigilance to keep the rodents under control, more particularly in view of their prolific rate of breeding.

Records show, however, that the incidence of rat attack is inclined to be seasonal. There are two peak periods, September to November and March to April. The intensity of attack is less marked in the second of these. It is interesting to note that the above periods correspond roughly with the two peak periods of fruit production, thereby suggesting the possibility of a migration to the oil palm when fruit is likely to be more abundant.

As stated previously rats are more prevalent in areas which are maintained under cover crops than in those which are clean-weeded. This applies equally to low-growing leguminous cover crops as well as to fern growths, such as *Nephrolepis* spp. It appears also that when rats cannot find suitable cover on the ground they will nest in the crown of the palm.

Methods of Control.

The methods of control practised at the present time on oil palm estates are: (a) hunting with dogs, (b) trapping, (c) poisoning by dusting the fruit and female inflorescences with barium carbonate, and (d) establishment of cat farms.

(a) *Hunting*. Periodic hunting by gangs of labourers, armed with stout sticks and accompanied by trained ratting dogs, is stated by some managers to be one of the most effective means of control. The interval between the operations varies according to the extent of infestation. On one estate of about 1,200 acres a gang of 10 Tamil boys patrols this area regularly twice a month, catching about 300 rats per day. They are paid at the rate of 1.5 cents per rat, which corresponds to a daily wage of about 45 cents.

(b) *Trapping*. This method is still in vogue on some estates. On an estate of about 600 acres a party of 3 labourers is regularly employed in trapping, each labourer catching from 35 to 70 rats per day according to the season. Based on wage payments, the cost corresponds to rather more than 1 cent per rat.

The traps are set in different fields each night, about 20 traps being required per acre. One labourer is able to attend to 200 traps.

Dried fish or fresh coconut meat is usually employed as a bait. The traps should be kept clean and lubricated periodically to ensure their working freely. A little oil of aniseed is frequently added to the lubricant to act as an attractant and to mask the odour of human beings or of previously caught rats.

Experience shows that trapping alone is likely to be only partially successful, since the majority of rats caught in the traps are male, the more important female rat remaining at large. Trapping should therefore be combined with some other method of control to ensure a greater degree of success.

✓ (c) *Poisoning*. The dusting of barium carbonate on the fruit bunches and, in some cases, on the female inflorescences has proved an effective means of control on many oil palm estates.

Although some estates dust with barium carbonate at regular intervals of 3 to 4 months, other estates carry out the operation only once or twice a year. In those cases where dusting is employed in addition to other methods of control, infestation is stated to be reduced considerably as a result of a second dusting about one month after the first application.

One estate records freedom from rat infestation solely as a result of dusting with barium carbonate and the operations are carried out only at intervals of about 7 months.

Dusting should preferably be carried out during dry weather, otherwise most of the poison may be washed away. Since rats are usually most troublesome during the period September to November, the dry months of June and July are most suitable for carrying out dusting operations. It is estimated that one labourer can treat an area of 2 to 3 acres of mature palms per day, applying the poison both to fruit bunches and female inflorescences. About 2 lbs. of barium carbonate are required per acre for each round of dusting. With the present price of barium carbonate ranging about \$10.50 per cwt., the cost of the material amounts to approximately 18 cents per acre per round. Allowing for labour, the cost of each dusting should not exceed 40 cents per acre. It will be appreciated that the cost of dusting will depend on the state of development of the palms.

Experiments conducted at Serdang on the use of barium carbonate showed that a proprietary mixture consisting of 70 per cent. of the chemical and 30 per cent. of an inert filler adhered to the inflorescences and fruits better than the pure barium carbonate dust. Further, it was found that this mixture could be stored for longer periods in an ordinary tin container than the pure chemical. Barium carbonate shows a tendency to become lumpy even though stored in a dry place, thereby detracting from its value as a dusting power.

Neither barium carbonate nor the proprietary mixture, even though applied to the stigmas when they were in a receptive state, had any material effect on the fertilization of the flowers and the subsequent development of the fruit bunches⁽²⁾.

Poisoning by means of baits in the form of pellets containing thallium sulphate and white phosphorus placed in the runs leading to the nests has been tried. No great degree of success was obtained.

(d) *Cat Farms.* A few estates have established cat farms with a view to turning the cats loose among the palms to hunt the rats.

On one estate of approximately 600 acres three lots of 100 cats each were housed in different parts of the estate. These cats are kept locked up for two or three months until they produce young. When the kittens begin to grow, they are fed on rice and milk in the morning and rats in the afternoon. After some time they are allowed to run loose among the palms, but to encourage them to stay on the estate a certain amount of cooked rice is placed outside the houses each day. This method of control is stated to be fairly effective and if the rats are not caught they are driven off the estate by the semi-wild cats.

A sharp look-out must be kept for panthers which, if undetected, will play havoc with the cat population.

On other estates the practice has been to purchase a batch of 50 to 100 cats, turning them loose in the fields without providing shelter or food. In such cases the cats become completely wild.

Cost of Rat Control.

As mentioned previously the usual rate of remuneration is about 1 cent per rat, although on some estates a difference is made between the rate for male and female rats. Half a cent may be paid for a male rat and 2 cents for a female rat.

Dusting with barium carbonate costs about 40 cents per acre per round, including the cost of the poison and the labour for dusting.

Estates on which rat infestation is serious estimate the cost of control at \$1 to \$1.50 per acre per annum, but in cases where rats are not so troublesome, the cost is said to vary from 50 to 75 cents per acre per annum.

Summary.

While some estates prefer poisoning with barium carbonate as a means of rat control, others adopt either hunting or trapping. A few estates have established cat farms; this method of control, however, has proved to be only partially successful and it has usually been found necessary in such cases to resort either to poisoning or hunting by labourers.

There is no doubt that rats gradually become accustomed to certain measures of control, more particularly trapping and poisoning, and it is only by constantly changing the methods that the best results are likely to be obtained.

Acknowledgment.

The writer wishes to express his thanks to the various agency houses and managers of oil palm estates for supplying him with information on this subject.

References.

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2. Georgi, C.D.V. and Lambourne, J. Note on the Use of Barium Carbonate as a Rat Poison on Oil Palm Estates, *Malayan Agricultural Journal*, Vol. XXIII, December, 1935, p. 580.

Received for publication 25th August, 1939.

Departmental. FROM THE DISTRICTS.

September, 1939.

*Compiled in the Office of the Chief Field Officer from Monthly Reports of
Agricultural Officers.*

The Weather.

Heavy rain occurred almost everywhere during September. On the west coast from Selangor northwards to Kedah there were particularly heavy falls of rain and the total precipitation was above normal. Elsewhere normal wet season weather was experienced.

In Kelantan the first half of the month was dry. Frequent storms in the second half brought the total precipitation up to normal.

Crop Reports.

Rubber.—Following the outbreak of war rubber prices soared, and reached \$52 per picul in Penang. Later the price of smoked sheet steadied at around \$45 per picul. Uncoupons rubber is now fetching \$18 per picul and the value of coupons has correspondingly decreased. Many holdings are now being brought into tapping again after a long period of resting. Owners of rubber land are at present obtaining a higher income than they have since 1937.

Under present market conditions there are indications that the small-holder does not consider replanting so attractive a proposition as it appeared to him even a month ago.

It is reported that small-holders are taking a renewed interest in the production of smoked sheet. New smoke cabinets have been constructed and old ones re-conditioned. The present price margin of \$2 to \$3 per picul between smoked and unsmoked sheet once again makes smoke curing worth while for the small producer.

Unemployed youths at Dong in Pahang are being given instruction once a week in budding rubber. It is expected that they will have a good market for their skill in 1940 by which time many holdings will be ready for budding.

Padi.—The rains enabled planters to get ahead with cultivation in all padi areas. At Sungei Acheh, Province Wellesley, very heavy falls of rain occurred in the middle of the month and floods resulted. Some of the newly planted padi was destroyed. In Negri Sembilan and Malacca, in spite of the rain, water supplies are not yet up to normal. Very little rain fell at Jasin and Alor Gajah in Malacca and in Alor Gajah particularly padi land is still very dry.

In Kelantan the late arrival of the rains has resulted in a shortage of water and the outlook for the wet padi crop is not at the moment particularly bright. The dry padi crop on the other hand has had a reasonably good start and prospects are favourable.

Although owners of padi land seem to have responded to the drive to get an increased area planted this season, it is felt that the present high price of rubber may in many instances result in a transference of activity from rice fields to rubber holdings.

A quite remarkable increase in the area under wet padi in Brunei is taking place, particularly so in view of the very small population of this State. Between 1st January, 1939, and 25th September over 800 applications for titles for wet padi land were received, representing an area of only slightly less than 2,000 acres.

Food Crops.—An increase in the planting of food crops may now be observed. Small-holders are advised to plant up any unoccupied portions of their holdings with suitable food crops. Estate managers are also giving the matter their attention and on many estates nurseries of planting material have been laid down and areas are being prepared on which food crops may be planted to augment the food supply of the labour force should a shortage occur.

Owners of coconut holdings have been badly hit by the low price of copra. In East Pahang small-holders are finding it profitable to tap their palms for the production of sugar.

"Ladies Days" at Padi Test Stations.

It is the custom of the country that much of the arduous work of padi cultivation and also the actual planting and harvesting of the crop is undertaken by the Malay women, and in fact they often know as much, if not more, about padi and padi cultivation than do the men; in addition it is, of course, the women who do the cooking of the rice. Consequently in matters relating to padi planting it is often the women who determine what variety shall be planted and in what manner. In the ordinary course of events these women would never visit a Padi Test Station and would, therefore, never receive practical proof of the advantage of planting improved strains of padi or of undertaking such better methods of cultivation as are being advocated by the Department. For this reason the innovation of "ladies days" have been instituted and in some instances they have been outstandingly successful. Such a gathering was held at Genting Test Station in Province Wellesley during September. About 100 women were present. They were shown round the Station by the Malay Agricultural Assistant, chaperoned by his wife and accompanied by kampong elders. The women asked many questions and evinced an intelligent interest in all that they were shown.

DEPARTMENTAL NOTES.

Recent Departmental Publications.

The Department of Agriculture has recently revised several of the Agricultural Leaflets, which are available for free distribution in Malaya, and also published new Leaflets on food crops suitable for cultivation during the present state of emergency.

The following are particulars of such Leaflets.

- No. 1. Derris. 3rd and revised edition.
- 6. Cover Crops. 2nd and revised edition.
- 7. Green Manures -do-
- 8. Fodder Grasses -do-
- 15. Lawn Grasses -do-
- 18. The Cultivation of Allotments by Tamil Labourers.
(Also in Tamil). 2nd and revised edition.

New Leaflets.

- No. 19. Ragi.
- 20. Yams.

A 2nd and revised edition of Leaflet No. 5, Bananas, is now being prepared and will be available by the end of October.

The following Special Bulletins have recently been published.
Scientific Series.

- No. 22. The Identification of Grubs from Rubber Estates, by G. H. Corbett and N. C. E. Miller. 50 cents.

Economic Series.

- No. 10. Malayan Agricultural Statistics 1938, by D. H. Grist. \$1.

A full list of available Departmental publications appears at the end of this Journal, and all publications can be obtained on application to the Agricultural Economist, Department of Agriculture, S.S. & F.M.S., Kuala Lumpur.

Leave.

Mr. J. R. P. Soper, Agricultural Officer, returned from leave on the 21st September, 1939, and assumed duty as Supplementary Agricultural Officer, Perak South, on the 26th September.

Appointment.

Mr. Gunn Lay Teik, Chemist, has been appointed to act as Chemist (Coconut Products) in addition to his own duties with effect from 24th July, 1939.

Mr. J. Cook, Agricultural Officer, was transferred from the Central Experiment Station, Serdang, and assumed duty with effect from 25th September as Supplementary Agricultural Officer, Selangor, in connexion with the efforts being made to increase the production of padi and food crops generally.

FERTILIZER PRICES, SEPTEMBER, 1939.

The following are the prices current for the month of September, 1939, of some of the more important fertilizers.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	—	80.00
Calcium Cyanamide	...	20.6	—	—	—	95.00
Muriate of Potash	...	—	—	—	50	115.00
Sulphate of Potash	...	—	—	—	48	120.00
Superphosphate (concentrated)	...	—	39	—	—	110.00
Superphosphate	...	—	16-18	—	—	65.00
Basic Slag	...	—	—	16	—	52.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50¶
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total

¶ \$31.50 per ton ex-warehouse, Singapore.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang. with the exception of muriate of potash which is *ex* warehouse, Port Swettenham. Klang and Singapore.

Statistical.

MARKET PRICES.

September, 1939.

Major Crops.

Rubber.—The month was notable for violent fluctuations in the rubber market due to the commencement of hostilities. No. 1. X. Ribbed Smoked Sheet, which opened at 29½ cents per lb., rose rapidly to 38 cents, fell to 34 cents, rose again to 39 cents, and then fell steadily to close at 33¾ cents.

The average of daily quotations for the month was 35.13 cents per lb., as compared with 28.51 cents in August. The London average price was 9.59 pence per lb., and New York 21.03 cents gold, as compared with 8.57 pence and 16.56 cents gold respectively in August.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

**Weekly Prices Paid by Local Dealers for Small-Holders' Rubber,
September, 1939.**
(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak	Kuala Pilah, Negri Sembilan			Batu Pahat, Johore.	
	6	7	21	28	6	13
Smoked sheet ...	35.00	41.00	43.40	40.00	45.30	—
Unsmoked sheet ...	—	—	—	39.50	40.39	44.00
Scrap ...	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 13th, 20th and 27th, at Kuala Pilah on the 14th, and at Batu Pahat on the 20th and 27th September.

Palm Oil.—Prices at the 1st September were: palm oil £13, kernels £8.5.0. Nominal quotations later were in the neighbourhood of £16 for oil but subsequently a Government controlled price of £14.15 per ton was fixed. The averages of the August quotations were:—palm oil £12.5.0, kernels £8.1.8.

Copra.—At the commencement of the war the copra market fell heavily but recovered towards the end of the month. The sun-dried grade opened at \$3.20 per picul but fell to \$2.25 on the 6th September; in the second half of the month the price improved and the market closed at \$3.65. The Singapore average price for the month was \$2.88 per picul as compared with \$3.50 in August. The mixed grade continued at 30 cents per picul lower than the sun-dried grade.

Copra cake fell to \$1.80 per picul but recovered to \$2, averaging \$1.94 as compared with \$2 in August.

Rice.—The Singapore average wholesale prices of rice per picul in August were as follows:—Siam No. 2 Ordinary \$3.72, Rangoon No. 1 \$3.55, Saigon No. 1 \$3.25, as compared with \$3.64, \$3.55 and \$3.37 in July, and with \$4.34, \$3.82 and \$4.05 in August 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were:—Singapore 24, Penang 30, Malacca 28, as compared with 26, 31 and 28 in July.

The average declared trade value of imports during August was \$3.54 per picul as compared with \$3.66 in July and \$3.68 in June.

Padi.—The Government Rice Mills, Perak and Pahang, maintained unchanged their price of \$2.20 per picul for padi. Retail prices of padi per 100 gantangs (gallons) ranged from \$7 to \$15 in Negri Sembilan, from \$8 to \$14 in Pahang, from \$10 to \$13 in Selangor, from \$8.50 to \$14 in Perak, varying with locality. In Penang and Province Wellesley the price was \$9.55 and in Kedah from \$7.30 to \$7.70. In Brunei the range was \$10 to \$12 and in Labuan \$11 to \$14.

Pineapples.—Prices continued unchanged at the levels laid down by the Central Board of Packers. Prices, per case of 48 cans of 1½ lbs. each, were G.A.Q.: Sliced Flat \$3.20, Sliced Tall \$3.35, Cubes \$3.25; Golden: \$3.60, \$3.75 and \$3.65 respectively.

Canning factories were closed during September and fresh fruit prices are therefore not available.

Beverages.

Tea.—No London prices are available for September.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 19th September, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Teas 96, Medium Grown Teas 84, Low Grown Teas 76.

Coffee.—Liberian coffee was quoted throughout the month in Singapore at \$15.50 per picul. Excelsa improved from \$10.25 to \$10.50, and Robusta rose from \$7 to \$7.50.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$9.90 to \$11.88 per picul, and for Sourabaya coffee \$12.69 to \$15.31. The August averages were \$11.10 to \$12.80 and \$9 to \$10.35 respectively.

Spices.

Arecanuts.—The averages of the Singapore Chamber of Commerce quotations per picul, which were stated to be approximate only, were:—Best \$6.25, Medium \$5.96, Mixed \$5.64.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$3.94 to \$5.44, Red Whole \$4.69 to \$6.44, Sliced \$6.56 to \$8.63, as compared with \$4.05 to \$5.40, \$4.30 to \$5.55, and \$8.70 to \$10.65.

Pepper.—Prices rose early in the month, and averages of quotations per picul were: Singapore Black \$8.65, Singapore White \$14.05, Muntok White \$14.70. August averages were: \$7.25, \$11.25 and \$11.50 respectively.

Nutmegs.—No quotations have been given after the opening ones of \$24.50 per picul for 110's and \$28 for 80's. In August both grades were quoted at \$28 per picul. Penang dried nutmegs were sold at \$18.50 per picul.

Mace.—No quotations have been available after the opening ones of \$85 per picul nominal for Siouw and \$46 for Amboina. The August average prices were \$85 and \$51.50 respectively. Locally produced mace, dry, was sold in Penang at \$70 per picul.

Cloves.—Nominal quotations available were unchanged at \$40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 18th September, 1939, from Rs. 1.25 to Rs. 1.50 per lb.

Miscellaneous.

Derris.—The invalidation of the Dennis patent has so far had no opportunity to affect prices adversely. The war resulted at the beginning of the month in an increased demand for nearby shipments and the Singapore market prices improved by approximately \$2 per picul. In the hope that the market would rise further dealers have been reluctant to sell. Average prices per picul for September were as follows:—\$9 to \$10 for roots sold on a basis of ether extract, and \$18 to \$20 for roots sold on rotenone content.

Gambier.—There was no change in Singapore prices during September, and they were: Block \$8 per picul nominal, Cube No. 1 \$17.

Sago.—Prices rose considerably in Singapore but fell back slightly at the close. Pearl rose from \$4.25 per picul to \$12 and closed at \$10, averaging \$7.90, while Flour, Sarawak Fair, rose from \$2.50 to \$10, and closed at \$7.50, averaging \$5.71 per picul. The August average prices were \$4.09 and \$2.50 respectively.

Tapioca.—Only opening and closing prices are available. All grades rose from a little over \$4 to \$9.50 per picul. Average prices per picul were: Flake Fair \$6.87, Seed Pearl \$6.95, Medium Pearl \$7.05. The August averages were: \$4.06, \$4.32 and \$4.60 respectively.

Tobacco.—The general range of prices of dried leaf per picul was: 1st quality \$23 to \$37, 2nd quality \$14 to \$26, 3rd quality \$8.50 to \$20. In Negri Sembilan the range was \$12 to \$28, \$8 to \$20, \$7 to \$8, and in Pahang \$14 to \$30, \$10 to \$16, \$5 to \$8. In Malacca the price rose from \$21 per picul in August to \$31 in September.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

GENERAL RICE SUMMARY *

August, 1939.

Malaya.—Imports of foreign rice during August were 69,717 tons†, and exports 12,727 tons. Net imports were accordingly 56,990 tons, as compared with 65,212 tons in 1938.¶

Of the August imports, 50 per cent. were consigned to Singapore, 14 per cent. to Penang, 7 per cent. to Malacca, 22 per cent. to the Federated Malay States, and 7 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows (in tons, percentages in brackets):— Thailand 47,150 (67.6), Burma 15,201 (21.8), French Indo-China 6,232 (9.0), other countries 1,134 (1.6).

Of the exports during August, 64 per cent. were consigned to the Netherlands Indies and 36 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):— Thailand 11,052 (86.9), Burma 830 (6.5), French Indo-China 751 (5.9), parboiled 79 (0.6), Malayan production 15 (0.1).

August net imports by countries of origin were (in tons, percentages in brackets):— Thailand 36,098 (63.4), Burma 14,371 (25.2), French Indo-China 5,481 (9.6), elsewhere 1,040 (1.8).

India.—Foreign exports during January to July were 175,000 tons, as compared with 164,000 tons in 1938, an increase of 6.7 per cent. Of these exports 2.9 (3.0) per cent. were to the United Kingdom, 1.7 (4.9) per cent. to the Continent of Europe, 33.7 (37.2) per cent. to Ceylon, 4.0 (4.9) per cent. to the Straits Settlements and the Far East, and 57.7 (50.0) per cent. to other countries. The percentages in brackets are for the corresponding period in 1938.

Burma.—Foreign exports from the 1st January to 23rd August totalled 2,858,448 tons, as compared with 2,366,314 tons in 1938, an increase of 20.8 per cent. Of these exports 57.4 (41.2) per cent. were to India, 7.9 (9.8) per cent. to the United Kingdom, 7.3 (8.8) per cent. to the Continent of Europe, 9.2 (11.6) per cent. to Ceylon, 8.8 (14.0) per cent. to the Straits Settlements and the Far East, and 9.4 (14.6) per cent. to other countries. The percentages in brackets are for the corresponding period of 1938.

Average August prices of rice in rupees per 100 baskets of 75 lbs. each at Rangoon were:— Big Mills Specials 220, Small Mills Specials 225.

Thailand.—Exports of rice and rice products from Bangkok during the first half-year were 930,076 tons, as compared with 818,709 tons in 1938.

* Abridged from the Rice Summary for August, 1939, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1938.

Japan.—The latest information available was published in the June Summary.

French Indo-China.—Entries of padi into Cholon during the period 1st January to 15th August totalled 1,201,956 tons, as compared with 809,506 tons in 1938, an increase of 48.5 per cent. Exports of rice during the same period were 1,189,441 tons, as compared with 838,598 tons in 1938, an increase of 41.8 per cent.

The Netherlands Indies.—The latest information available was published in the March Summary.

Ceylon.—Imports during January to August totalled 404,074 tons, as compared with 376,088 tons in 1938, an increase of 7.4 per cent. Of these imports 14.5 (17.6) per cent. were from British India, 62.4 (70.6) per cent. from Burma, 0.2 (0.3) per cent. from the Straits Settlements, and 22.9 (11.5) per cent. from other countries. The 1938 percentages are in brackets.

Europe and America.—Shipments from the East to Europe from the 1st January to 11th August totalled 971,697 tons, as compared with 904,396 tons in 1938, an increase of 7.4 per cent. Of these shipments 36.8 (43.0) per cent. were from Burma, 46.7 (46.5) per cent. from Saigon, 15.6 (9.1) per cent. from Thailand, and 0.9 (1.4) per cent. from Bengal. The 1938 percentages are in brackets.

Shipments for the Levant from 1st January to 5th August totalled 14,535 tons, as compared with 26,735 tons in 1938, a decrease of 45.6 per cent. Shipments for Cuba, West Indies and America from 1st January to 31st July were 119,712 tons, as compared with 122,075 tons in 1938, a decrease of 1.9 per cent.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1939.

PRODUCT	Net Exports in Tons				
	Year 1938	Jan /August 1938	Jan. /August 1939	August 1938	August 1939
Arecanuts ...	33,769	26,383	25,114	2,679	3,179
Coconuts fresh†† ...	116,743†	68,525†	66,250†	7,472†	6,536†
Coconut oil‡ ...	49,140	28,815	39,523	4,185	6,552
Copra‡ ...	68,754	28,267	34,490	2,823	17,969
Copra cake ...	7,112	4,628	6,164	745	1,505
Gambier, all kinds ...	1,632	1,104	1,055	234	168
Palm kernels ...	9,359	5,412	6,497	570	725
Palm oil ...	54,377	35,645	39,335	6,368	10,920
Pineapples, canned ...	73,168	55,038	60,297	5,349	5,673
Rubber¶ ...	360,898¶	257,736¶	218,615¶	26,754¶	28,780¶
Sago,—flour ...	4,537	352	3,812	321*	67
„ —pearl ...	4,203	2,761	2,329	443	289
„ —raw ...	5,088*	3,557*	3,204*	316*	491*
Tapioca,—flake ...	981	631	575	117	26
„ —flour ...	3,072*	2,243*	1,896*	69*	321*
„ —pearl ...	17,818	12,843	11,228	1,834	1,485
Derris ...	676	336	726	52	64
† Copra equivalent ...	150,944	76,461	100,040	9,772	28,743

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
August ...	3,613.2	3,004.2	6,617.4	680.8	554.0	1,234.8
Total ...	19,616.3	17,982.0	37,598.3	3,553.7	3,023.1	6,576.8
Total January to August, 1938 ...	18,004.5	13,926.2	31,930.7	3,183.8	2,308.0	5,491.8
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 31st August, 1939, were: palm oil 3,462 tons, palm kernels 984 tons.

MALAYAN RUBBER STATISTICS.
ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 31ST AUGUST, 1939.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH			Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acres (7)	Percent- age of (7) to (2) (8)	Acres (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Average (13)	Percent- age of (13) to (2) (14)	
		Acres (3)	Percent- age of (3) to (2) (4)	Acres (5)	Percent- age of (5) to (2) (6)									
S. S.—														
Province Wellesley ...	43,044	928	2.2	13,394	31.1	507	1.2	14,322	33.3	28,722	66.7	7,845	18.2	
Malacca ..	* 118,205	4,792	4.1	34,576	29.2	2,048	1.7	39,368	33.3	78,837	66.7	23,477	19.9	
Penang ..	2,505	nil	nil	1,106	44.2	35	1.4	1,106	44.2	1,399	55.8	60	2.4	
Singapore ..	32,052	5,475	17.1	9,905	30.9	275	0.9	15,380	48.0	16,672	52.0	3,732	11.6	
Total S.S. ...	195,806	11,195	5.7	58,981	30.1	2,865	1.5	70,176	35.8	125,630	64.2	35,114	17.9	
F. M. S.—														
Perak ...	284,009	10,602	3.7	70,180	24.7	7,404	2.6	80,782	28.4	203,227	71.6	48,424	17.1	
Selangor ...	315,651	8,037	2.5	69,601	22.1	6,937	2.2	77,638	24.6	238,013	75.4	51,887	16.4	
Negri Sembilan ...	261,831	11,624	4.4	68,994	26.4	11,706	4.5	80,618	30.8	181,213	69.2	40,823	15.6	
Pahang ...	85,286	4,383	5.1	25,561	30.0	5,505	6.5	29,944	35.1	55,342	64.9	9,969	11.7	
Total F.M.S. ...	946,777	34,646	3.7	234,336	24.7	31,552	3.3	268,982	28.4	677,795	71.6	151,103	16.0	
U. M. S.—														
Johore ...	478,161	17,831	3.7	144,598	30.3	36,457	7.6	162,429	34.0	315,732	66.0	60,892	12.7	
Kedah ...	199,315	9,816	4.9	28,096	14.1	6,687	3.4	37,912	19.0	161,403	81.0	42,460	21.3	
Kelantan ...	31,204	403	1.3	7,051	22.6	2,237	7.2	7,454	23.9	23,750	76.1	5,463	17.5	
Trengganu (d) ...	4,817	nil	nil	42	0.9	nil	nil	42	0.9	4,775	99.1	2,301	47.8	
Perlis (e) ...	1,459	380	26.0	341	23.4	155	10.6	721	49.4	738	50.6	394	27.0	
Brunei ...	5,918	nil	nil	1,833	31.0	313	5.3	1,833	31.0	4,085	69.0	1,458	24.6	
Total U.M.S. ...	720,874	28,430	4.0	181,961	25.2	45,849	6.4	210,391	29.2	510,483	70.8	112,968	15.7	
Total MALAYA ...	1,863,457	74,271	4.0	475,278	25.5	80,266	4.3	549,549	29.5	1,313,908	70.5	299,185	16.1	

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th June, 1939.

MALAYAN RUBBER STATISTICS Table I.

ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX,
FOR THE MONTH OF AUGUST, 1939, IN DRY TONS.

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State or Territory	Stocks at beginning of month 1			Production by Estates of less than 100 acres and over			Production by Estates of 100 acres and over			Imports			Exports including re-exports during the month			Stocks at end of month			Consumption	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1939	during the month	Jan. to July 1939	during the month	Jan. to July 1939	Foreign	From Malay States & Labuan	From Malaya & Labuan	Foreign	Local	January to July 1939	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1939
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Federated Malay States
Johore
Kedah
Perlis
Kelantan
Trengganu
Brunei
Total Malay States
S. SETTLEMENTS:—
Malacca
Province Wellesley
Penang
Singapore
Labuan
Total Straits Settlements
Total Malaya

TABLE II
DEALERS' STOCKS, IN DRY TONS

Class of Rubber	Fede- rated Malay States	S'pore	Penang	Proce- ince We- lay D'ring's M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	2,736	12,714	1,862	1,945	1,900	131
WET RUBBER	598	260	234	342	241	73
TOTAL	3,334	13,074	2,096	2,287	1,441	204

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to July 1939
Singapore	35,940	237,554
Penang	11,859	72,917
Port Swettenham	5,576	35,111
Malacca	142	815
MALAYA	53,457	345,547

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to July 1939
Malay States	30,967	207,562
Straits Settlements	2,564	17,029
MALAYA	33,531	224,591

- Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e. Column (7) = Columns (13) + (14) + (17) + (18) + (19) + (20) + (21) — (2) — (4) — (5) — (9) — (10). For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by census field.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scan, lump, etc., 40%.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by census field.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd September, 1939.

METEOROLOGICAL SUMMARY, MALAYA, AUGUST, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.						
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total	Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.		
	A. Max.	B. Min.		Highest	Lowest	Min.	Max.					Highest	Lowest	Precipitation, .01 in or more	Thunder-storm				Fog morning obs.	Gale force 8 or more
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.	in.	in.	in.	hrs.	hrs.			
Railway Hill, Kuala Lumpur, Selangor	92.1	71.7	81.9	97	70	88	75	83.8	84.8	2.77	70.4	1.32	11	8	2	2	194.55	6.27	51	
Bukit Jeram, Selangor†	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sitiawan, Perak	90.8	72.5	81.7	94	70	86	76	85.0	85.4	1.64	41.7	0.50	8	7	2	—	207.50	6.69	55	
Ipoh Aerodrome, Perak	90.6	72.2	81.4	95	70	84	75	83.5	84.5	3.77	95.8	2.07	7	7	—	—	155.72	5.02	41	
Temerloh, Pahang	91.4	71.8	81.6	95	69	84	75	85.9	87.0	3.11	79.0	2.10	10	6	1	13	200.85	6.48	53	
Kuala Lipis, Pahang	90.2	71.0	80.6	95	69	82	74	82.9	84.6	4.48	113.8	1.23	12	9	3	26	173.40	5.59	46	
Kuala Pahang, Pahang	88.1	74.3	81.2	91	71	83	77	86.3	88.1	4.92	125.0	1.54	10	7	4	—	208.95	6.74	55	
Kallang Aerodrome, S'pore	85.9	75.9	80.9	90	72	81	81	82.0	83.4	7.76	197.1	1.63	17	13	2	—	170.30	5.49	45	
Bayan Lepas Aerodrome Penang	86.3	74.8	80.5	89	72	78	79	83.4	84.5	12.35	313.7	3.19	18	14	3	—	196.20	6.33	51	
Malacca Town, Malacca	85.5	74.4	79.9	88	72	78	78	83.9	85.1	4.45	113.0	1.13	16	13	2	—	196.85	6.35	52	
Kluang, Johore	89.0	71.0	80.0	93	69	84	73	81.8	82.7	2.85	72.4	0.81	13	11	2	1	183.65	5.92	49	
Mersing, Johore	88.5	71.9	80.2	93	69	79	74	82.7	83.2	4.93	125.2	1.60	11	9	8	—	190.95	6.16	50	
Alor Star, Kedah	87.3	74.1	80.7	91	72	79	76	84.4	85.3	7.78	197.6	1.80	11	11	—	—	220.70	7.12	58	
Kota Bharu, Kelantan	90.2	72.8	81.5	94	70	85	76	84.9	85.5	5.40	137.2	1.81	10	7	1	—	231.55	7.47	61	
Kuala Trengganu, Trengganu	89.3	73.0	81.1	92	70	85	75	86.1	87.0	3.17	80.5	1.26	9	7	5	1	198.05	6.39	52	
Labuan	87.3	77.0	82.1	91	71	79	81	84.7	86.4	11.74	298.2	3.96	12	10	1	—	217.70	7.02	57	
HILL STATIONS.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fraser's Hill, Pahang 4268 ft.	74.9	62.7	68.8	79	61	71	65	72.3	72.7	3.16	80.3	1.02	12	9	—	9	186.35	6.01	49	
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	71.5	57.2	64.3	74	51	66	62	70.2	69.6	2.91	73.9	0.53	16	13	1	3	150.85	4.87	39	
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	71.2	59.2	65.2	75	57	64	61	*	*	3.77	95.8	0.68	16	14	—	—	159.05	5.13	42	

THE Malayan Agricultural Journal.

NOVEMBER, 1939

EDITORIAL.

Copra Deterioration. The allied subjects of copra preparation and marketing have received considerable attention from the Department of Agriculture, and have absorbed the full-time services of a research specialist for the last decade.

The main objectives of local copra research investigations were envisaged some ten years ago as consisting primarily of a determination of the characteristics of high-grade copra and of an elucidation of the methods of preparation, suitable both to large and small-scale producers, by which those characteristics could be secured. While it is not claimed that finality has been reached, it may be said that the technique and design of equipment required to produce a high quality of copra under Malayan conditions are now reasonably well understood.

An article in this number discusses the factors responsible for copra deterioration and shows that loss and deterioration are very considerable in the case of half-dried "raw" copra, if delay occurs before it is suitably bulk stored. Some 80 per cent. of Malaya's 613,417 acres of coconuts is owned by small-holders and much of the copra produced on their holdings is of the "raw" type. This unfortunate position apparently is due less to ignorance or apathy on the part of the small-holders than to the fact that under present conditions, with certain exceptions, a high-quality product does not command a premium which compensates the individual producer for the extra care and labour required for its production. In some localities, particularly where only one quality of copra is recognized, the local market is organized to handle an inferior product and to pay for it at a correspondingly low price. In others, the market demands and is prepared to pay for extra quality. To what extent these circumstances will affect the improvement of the standard of Malayan copra in the world market, a standard which has risen in recent years, remains to be seen.

Sir Frank Stockdale's Report.

The September number of this Journal contained a summary of the conclusions reached by Sir Frank Stockdale, K.C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies, as a result of his visit to study Malayan Agriculture. On the conclusion of his visit to Malaya, Sir Frank Stockdale proceeded

to the Netherlands Indies and thence to Ceylon and we publish in this number an abstract of his report on the agriculture of those countries.

The keynote of agriculture in Java is high intensity of cultivation rendered necessary by population density and possible by inherent richness of the soil. Every effort is made to maintain this intense cultivation by close attention to soil conservation and the maintenance of soil fertility, which, coupled with crop improvement *via* the medium of plant breeding, are apparently the keynotes of agriculture in the Netherlands Indies. The research and advisory services concerned have a very impressive record of achievement, and it is also interesting to note the high standard of agricultural education and the facilities which exist for the provision of rural credit. Sir Frank Stockdale concludes that the British Colonial Empire can learn much from the achievements of the Dutch in the Netherlands Indies and considers it apparent that greater attention will have to be given in future to the role of plant breeders in improving tropical agriculture.

In Ceylon, the three major agricultural industries—tea, rubber and coconuts—have each their own separate research and advisory service, a system which leaves the Department of Agriculture free to pay greater attention to the needs of those growing padi and other secondary crops and to the agriculture of the peasant small-holder generally.

The work of the various research institutes and schemes is described and it is considered that they are now firmly established and doing useful work for the industries for which they were created. A number of suggestions are made for desirable future research, and Ceylon is apparently no exception to the general rule that greater attention should be paid to the twin problems of soil conservation and the maintenance of soil fertility. The work of the Department of Agriculture has been largely educational, and it is interesting to note the progress which has been made along the lines of fruit cultivation, animal and poultry husbandry, soil conservation, agricultural marketing and co-operation. Sir Frank Stockdale feels that while much remains to be done, it is very encouraging to see the developments in agricultural research and the considerable efforts that have been made in Ceylon by means of advisory services, propaganda and education to translate the results of such research into that island's agricultural practice.

Original Articles.

COPRA DETERIORATION DURING STORAGE AND SHIPMENT

BY

F. C. Cooke,

Chemist (Coconut Products).

Introduction.

Copra is a perishable commodity. The amount of deterioration and loss of actual copra which can occur varies in different circumstances. Commencing with a given quantity of fresh coconut meat, the ultimate quality and the quantity of copra received at the mill depend on four factors:—

- (a) Care exercised in the preparation of the product.
- (b) Moisture content of the freshly prepared copra.
- (c) Treatment during bulking, storage and transport.
- (d) Length of time elapsing between production and milling.

Period of Storage.

The time elapsing between production and milling is dependent on locality of production, difficulties of collection and local transport, seasonal variation in crop, freight charge fluctuations, amount of cargo space available in ocean-going steamers, and the state of the copra market.

In the case of Straits copra, when shipments keep pace with purchases, the normal interval is just over 2 months, but, in exceptional circumstances, the copra may be held in store for 2 or 3 months prior to shipment. Thus for example, during the Great War it was impossible, on occasions, to obtain cargo space from certain ports and, more recently, a long period of low prices resulted in considerably reduced shipments. When such situations arise, stocks accumulate in the warehouses, and small dealers, and even producers, may be forced to hold up their copra.

Table I provides a rough detailed estimate of the time taken to pass copra from the small-holder in this country to the miller in Europe.

Some of the operations shown therein may be omitted or all may be included in full, so that small-holders' copra which is exported may take from one to seven months to reach the oil mill.

Estate copra is nowadays generally exported from the estate direct to Europe on a through bill of lading and little more than a month need elapse between production and milling.

Copra milled locally is seldom kept for more than a month after production.

Copra Trading.

In the case of the small producer, a small quantity of "raw," half-cured or somewhat under-dried loose copra may perhaps be kept for as long as a week before

Table I.

**Approximate Times for Various Operations which may occur
between Producing and Milling Small-holders' Copra.**

Operation	Time
	days
House storage	1 to 7
Shophouse storage	0 to 7
Local dealers' stores	0 to 7
Road, river or coastal transport	1 to 4
Warehousing at export centre	0 to 150
Ocean shipment	30 to 40
Bulk storage before milling	3 to 14
Total	35 to 229

the collector calls or delivery is arranged. Whenever possible the copra is sold without delay. These small parcels of copra are bulked by a succession of buyers—the shop-keeper, the transporter, the small local dealer, and ultimately the export dealer and shipper—into consignments of gradually increasing size.

Since he usually buys his copra at a flat rate from producers and then may sell it on a dry-weight basis to the merchants, the local dealer will usually lay the wettest copra out in the sun for further redrying, particularly when it is likely to pay him to delay resale. Conversely, when copra is sold at a flat rate, cases have occurred where the lowest grades of copra have been deliberately moistened by the seller to increase the weight.

The bulked copra which ultimately arrives at the export centres, Singapore, Penang and Port Swettenham, from the different production centres is variously dry and exhibits different features and degrees of deterioration depending on the treatment accorded to the product and the effect of weather conditions on production, storage and shipment. It is for this reason that it is described as "mixed" copra, *i.e.*, a mixture of f.m.s. and f.m. copra*; the geographical origin is added to this description, *e.g.* Kelantan "mixed" copra, and this serves to identify the quality, since each coconut district has its particular standard of quality, or a recognized f.m.s./f.m. ratio for "mixed" copra.

* The terms f.m.s. and f.m. are expressions of quality and denote respectively "fair merchantable sundried" and "fair merchantable", the latter being the inferior quality.

The small-holders' bulked copra now being received from most districts is reasonably dry and of high quality and the "ratio" for copra from these districts has distinctly improved; nevertheless some of the copra coming generally from the more remote regions still continues to be of inferior quality. In exceptional cases, such copra is wholly f.m. quality and is offered in a "raw" condition.

Conditioning of Copra by Storage.

"Raw" or half cured copra, if produced near the export centres, is usually received at the export warehouses in a fresh condition but that from the more distant and inaccessible regions or from those places where collection is difficult, is more often badly deteriorated, except when the local dealers or shippers have redried the product before sending it to the export centres.

Fresh "raw" copra, as received, is warm, has a pale yellow gummy surface, is free from mould, and exudes a not unpleasant yeasty odour. Deteriorated "raw" copra is hot, black, soft, matted and glutinous, insect-ridden and dirty; it is covered with a thick layer of wet slime and black mould and has a revolting sour smell.

All bags of "raw" copra are usually emptied without delay, and the contents built up into a huge stack.

Continuous records show an initial rise in temperature inside such a stack from 35° to 52°C. in about 3 hours. Subsequently the temperature declines slowly to about 38°C. on the eighth day of storage and after that even more gradually to about 30°C. in about three weeks, by which time the moisture content has been reduced to between 4 and 5 per cent. During this period the temperature of the stack rises each night when the warehouse doors are closed.

The condition of fresh "raw" copra which has been expeditiously reconditioned may be surprisingly good in spite of previous superficial development of bacterial slimes. In one instance, although a sample of such copra after reconditioning had a dirty greyish-yellow appearance, it shewed little internal discoloration while only 4 per cent. of the pieces were deeply corroded and there were only 8 per cent. of "smalls." The copra had a not unpleasant smell and the acidity of the contained oil was only 0.8 per cent., calculated in terms of lauric acid.

"Raw" copra which has been permitted to deteriorate seriously before warehousing cannot be satisfactorily reconditioned. After warehousing, the whole of the copra is internally discoloured, the range of colour being light-brown to black. The bulk of the pieces are very deeply corroded and all are in process of breaking down into small fragments. There is a very high percentage of "smalls," foreign matter and dust, and the acidity of the contained oil, calculated as lauric acid, is usually in excess of 5 per cent. Such copra is therefore below Straits f.m. quality and requires to be "brightened" with copra of somewhat better quality before shipment.

Irrespective of their condition, the various consignments of "mixed" copra received at the warehouses are usually all made up into large stacks of loose or bagged copra as described above. In this way, copra is self-dried by its own heat of decomposition,* the contained moisture being reduced from anything between 7 and 25 per cent. to between 4 and 7 per cent. according to season. A relatively stable and reliable product is thus obtained which may be sorted, blended and graded for export. The length of storage required depends principally on the moisture content of the copra on receipt, but occasionally self-drying may be curtailed to make up a consignment, when copra is short. Dry copra requires about a week's storage, fairly dry copra about 14 days, and very wet copra as much as three weeks before it is ready for shipment.

Blending and Bulking for Shipment.

Copra is exported in two grades, Straits f.m.s. and Straits f.m. After warehouse drying, the various lots of "mixed" copra are either up-graded by the removal of defective pieces or down-graded by the removal of good pieces, whichever is necessary to produce the required grade. Occasionally there is no picking over, since a parcel may be used to brighten up or bring down a consignment of bulked copra to the desired standard. The method of bulking is to build up, layer upon layer, the various parcels of copra from different sources, so that blending and mixing takes place when this stack of loose copra is broken up and the copra shovelled into sacks. The copra then remains in bags until shipment can be arranged.

During ocean shipment a certain amount of self-heating again occurs in the copra, which is subjected to considerable pressure and disturbance due to the movement of the ship. The individual bags of copra enter the ships' holds at about air temperature (28°C); subsequently there is a slow daily rise for three days to about 35°C. or more according to the efficiency of ventilation in the holds and the condition of the copra; ultimately when more temperate regions are reached the temperature gradually declines.

The merchant shipper who prepares the copra for export takes full responsibility for the ultimate quality of the copra on arrival and for any serious loss in weight in transit.

The foregoing remarks do not usually apply to estate copra which is nowadays mostly of uniformly good quality and can, in consequence, be shipped direct from the estate to Europe without any warehousing, inspection, or blending being necessary. Such copra is classified as Straits f.m.s., although for copra to be forwarded without inspection or warehousing it has, of necessity, to be above normal quality to avoid the possibility of subsequent disputes and arbitration. It is obvious that the interval between production and milling will be much reduced with direct shipment and the amount of handling will also be considerably less. For these reasons, copra of this type usually obtains a small premium.

*For discussion on heat of decomposition see Special Bulletin No. 28, General Series, Department of Agriculture, S.S. & F.M.S. Copra Deterioration, pp. 20 to 22.

The agents of deterioration during transport and storage are yeasts, bacteria, various moulds and insects, and the heat of decomposition, but it is the moisture present in the copra which makes deterioration possible and determines which (if any) of the agents may operate and the extent of the deterioration and loss which occurs.

The individual effects of these several agents cannot be separately determined, as it is not practicable to restrict deterioration to a single factor. Nevertheless it is possible to determine, by experiment, the total deterioration and loss which may be expected to occur with a given set of conditions. Even then it is still not possible to follow normal trading, transport, storage and blending practice since copra under observation has to be periodically sampled and cannot therefore be mixed with other copra.

Storage Trials.

In order to ascertain the extent of the loss which occurs when different types of copra are kept for long periods under normal conditions of storage, two storage trials have been carried out with the six different types of copra shown in Table II. These may be regarded as representative of the different types of copra produced in Malaya. The majority of estates nowadays produce copra corresponding to grade W1, while the best small-holder producers offer grades W1 and W2. Nevertheless copra of grade W3 does still continue to be made in one or two inaccessible regions and this degenerates, according to the absence of care in production or to the treatment accorded to it by the local dealer, to yield copra corresponding to grades R1, R2, and R3.

Table II.
Types of Copra used in Storage Trials.

Lot	Initial Condition	Moisture Content
		per cent.
W 1	Dry smooth white copra	About 8
W 2	Fairly dry white copra	9 to 12
W 3	Half-dried "raw" white copra	About 20
R 1	Dry unscorched "red" copra	About 8
R 2	Fairly dry "red" copra	9 to 12
R 3	Half-dried "raw red" copra	About 20

The various lots described in Table II were each prepared from 100 nuts collected from the same estate. The "red" copra was produced by allowing bacterial decomposition to be initiated prior to drying and to continue to develop subsequently through deliberate carelessness during drying. All the copra was carefully kiln-dried over open smokeless fires.

Two methods of storage were used, the period of storage being 2 months in each case. In one, Trial A, the six lots of copra were sent immediately after manufacture for bulk storage in a Singapore warehouse with copra of corresponding qualities (continuous warm storage). In the other, Trial B, there was an initial period of 14 days during which the six lots of copra were kept in a cool place as individual isolated bags (cool storage). Subsequently this copra was warehoused as in the first trial.

It was not possible in either of these trials to simulate exactly the handling and movement, and the conditions of temperature and pressure to which copra is normally subjected during local trading, warehousing and ocean shipment. The conditions of the first trial may nevertheless be considered roughly to correspond to the treatment accorded to the copra from large producers, while those of the second trial are meant to simulate the treatment accorded to the copra made by small producers, amounting to about two-thirds of the total copra produced in Malaya.

The various lots of copra were each examined, weighed and sampled before, during, and after storage. These samples were analysed for moisture, and the acidity of the contained oil was also determined. At the conclusion of the period of storage, the amount of "smalls" and dust associated with each lot, which in practice is reckoned as copra, was also ascertained and the copra was examined qualitatively by a Singapore merchant.

Thus it was possible to estimate the true loss of copra which occurs during storage and to measure the amount of deterioration under the various conditions stated.

The comparative results of the two trials are shown in Tables III to IX inclusive.

Table III.
Total Loss in Weight during Storage.
(Weights correct to nearest $\frac{1}{2}$ lb.)

Lot	Trial A Continuous Warm Storage			Trial B Cool and Warm Storage		
	Original Weight	Loss in Weight	Loss	Original Weight	Loss in Weight	Loss
	lbs.	lbs.	per cent.	lbs.	lbs.	per cent.
W1 ...	63.75	1.50	2.3	56.25	3.25	5.8
W2 ...	68.75	5.50	8.0	64.25	6.00	9.3
W3 ...	78.75	18.75	23.8	79.75	20.50	25.7
R1 ...	60.50	3.25	5.3	58.50	3.25	5.6
R2 ...	67.50	6.00	8.9	64.25	10.00	15.6
R3 ...	78.50	17.00	21.6	74.50	20.25	27.2

The total loss in weight in storage includes not only loss of free moisture, but also loss of actual dry copra through decomposition. The loss is expressed as a percentage of the original weight of copra, including contained moisture. It is to be noted that in the transportation of "raw" copra (W3 and R3) about a fifth by weight of the consignment consists of avoidable moisture, thus increasing freight costs.

The final moisture content of the copra after warehouse drying was between 4 and 5 per cent. in all cases.

Table IV.
Loss of Actual Copra during Preparation and Storage.

(Weights correct to nearest $\frac{1}{4}$ lb.)

Lot	Trial A Continuous Warm Storage				Trial B Cool and Warm Storage				
	Original Dry Weight*	Prepa- ration Loss	Storage Loss	Total Loss	Original Dry Weight*	Prepa- ration Loss	Cool Storage	Warm Stor- age	Total Loss
	lbs.	lbs.	lbs.	per cent.	lbs.	lbs.	lbs.	lbs.	per cent.
W1	59.25	N	N	N	52.00	N	0.50	1.50	3.8
W2	61.75	N	1.75	2.8	56.50	N	N	1.50	2.6
W3	63.25	N	6.00	9.5	65.00	N	6.75	2.25	13.9
R1	55.25	1.50	0.25	3.2	55.25	1.50	2.00	1.00	8.1
R2	59.25	1.50	0.25	3.0	58.25	1.50	5.25	1.25	13.7
R3	61.25	1.50	2.50	6.5	58.50	1.50	5.25	2.00	15.0

(N = nil or negligible)

* The figures in these two columns were determined by converting the actual weight of each lot according to its moisture content.

It is perhaps surprising that lot W3 ("raw" white copra) of Trial A showed a greater loss than lot R3 ("raw red" copra) of the same trial. It was also more rank and infested by insects. This is doubtless because smoke adheres readily to the surface of slimy "red" copra and this film of smoke serves to provide a temporary check to insect attack and bacterial deterioration during the short period before warehouse-drying. Where there is prolonged cool storage before warehousing, as in Trial B, the agents of deterioration are able to operate freely once the protective smoky film has been broken down and penetrated.

The high spoilage for lots W3 and R3 of Trial B is not exceptional. Such extensive deterioration and breakdown can and do occur in practice.

In the extreme, with abnormally prolonged storage of deteriorated "raw" copra, maintained continuously in a wet condition, it is even possible for the loss to be in the neighbourhood of 99 per cent. since long sustained insect attack and progressive decay due to moisture produced during decomposition may leave only fragments of brown testa, or skin.

Attention is next drawn in Table V to the high production of "smalls" resulting from the storage of "raw" copra in Trial B. Individual pieces of copra were so deeply corroded as a result of deterioration during the period of cool storage that they readily broke down when pressure was applied to the copra or if the copra was disturbed.

Table V.
Reduction of Copra to "Smalls" and "Dust".

Lot	Trial A Continuous Warm Storage				Trial B Cool and Warm Storage			
	Original Dry Weight	"Smalls"	"Dust"	Percent- age Spoilage	Original Dry Weight	"Smalls"	"Dust"	Percent- age Spoilage
	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	
W1 ...	59.25	N	N	N	52.00	0.75	N	1.4
W2 ...	61.75	0.25	N	0.4	56.50	0.75	0.25	1.8
W3 ...	63.25	0.75	0.25	1.6	65.00	10.25	0.75	16.9
R1 ...	55.25	N	N	N	55.25	1.00	N	1.8
R2 ...	59.25	N	N	N	58.25	0.50	0.25	1.3
R3 ...	61.25	0.75	0.25	1.6	58.50	11.75	0.75	21.3

In Malaya any "smalls" and "dust" are included and sold as copra, but their presence in any quantity is a serious matter to the miller. Seriously deteriorated copra will suffer further size reduction during shipment and transport to the oil mills, so that a larger surface is exposed to the agents of deterioration and losses of small pieces and dust will occur when the material is transported loose in conveyors.

It is to be observed from Table VI that the development of acidity is not serious during the period of cool storage when the loss of copra is greatest (W3, R1, R2 and R3 of Trial B). Samples W3 in both trials had a revoltingly sour smell.

Table VI.
Acidity of Oil in Stored Copra.

(Calculated as lauric acid)

Lot		Trial A	Trial B	
		After 2 months Warm Storage	After Cool Storage only	After Cool and Warm Storage
		per cent.	per cent.	per cent.
W 1	...	0.17	0.11	0.30
W 2	...	0.22	0.16	0.32
W 3	...	2.61	0.81	3.11
R 1	...	0.25	0.17	0.47
R 2	...	0.58	0.15	0.39
R 3	...	2.20	0.40	6.12

Table VII gives the average depth of discoloration in the stored samples of copra. Actually the extent of deterioration varied considerably from piece to piece. Some pieces showed only localized deterioration whereas in others discoloration was complete.

Table VII.
Average Extent of Discoloration in
Copra on Storage.

Lot	Trial A	Trial B
W 1	All white	One-third
W 2	One-third	One-half
W 3	Three-quarters	Total
R 1	One-sixth	One-third
R 2	One-quarter	One-half
R 3	Three quarters	Total

The six lots of stored copra were inspected by a leading exporter and the result of this examination is given in Table VIII. It will be seen that the various lots were classified with respect to the export grades Straits f.m.s. and Straits f.m. as is the case with all copra after it has been stored and when it is ready for blending.

Table VIII.
Effect of Storage on Quality of Copra.

Lot	Quality of Copra after Storage	
	Trial A Continuous Warm Storage	Trial B Cool and Warm Storage
W 1	Straits f.m.s. ++	Straits f.m.s.
W 2	" f.m.s. +	" f.m.s.
W 3	" f.m. +	" f.m. —
R 1	Straits f.m.s.	Straits f.m. ++
R 2	" f.m. +	" f.m. +
R 3	" f.m.	" f.m. —

The ratings above and below the recognized export standards indicate to what extent each parcel needed to be blended with inferior or superior copra before export. Two plus and one plus mean "well above" and "above" respectively while a minus indicates that a consignment is below the export standard for the specified quality. It will be noted that with only one exception, *viz.* lot R2, each lot from Trial A is superior to the corresponding lot from Trial B.

Sub-grade copra, *i.e.* f.m.— can easily be recognized when the copra is purchased from the dealer and so can be and is usually penalized, but parcels of copra which may ultimately prove to be superior to the two recognized export grades receive no special premium above the recognized quotation although they have an added value when the various parcels are being blended for shipment.

Finally, Table IX gives the comparative values of the various types of copra derived from the same theoretical amounts of fresh coconut meat. The necessary calculations were based on the losses of actual copra as scheduled in Table IV, the ultimate quality of the material (whether f.m.s., f.m., or sub-grade), and the following prices of copra per picul:—

	per picul.			
	\$			
Estate copra, shipped direct	3.40
Straits f.m.s. copra	3.30
Straits f.m. copra	3.00
Sub-grade copra	2.70

Table IX.
Relative Market Values of Produce Obtained from the Same
Theoretical Weight of Coconut Meat.

Lot	Trial A Continuous Warm Storage			Trial B Cool and Warm Storage		
	Final Dry Weight	Price of Copra per picul	Value of Copra	Final Dry Weight	Price of Copra per picul	Value of Copra
	piculs	\$	\$	piculs	\$	\$
W 1 ...	100	3.40	340.00	96.2	3.30	318.00
W 2 ...	97.2	3.30	321.00	97.4	3.30	321.00
W 3 ...	90.5	3.00	271.50	86.1	2.70	232.00
R 1 ...	96.8	3.30	319.00	91.9	3.00	275.70
R 2 ...	97.0	3.00	291.00	86.3	3.00	258.90
R 3 ...	93.5	3.00	280.50	85.0	2.70	229.00

The figures show clearly the extent to which deterioration can affect the value of the copra. Thus in the case of Trial B, Lots W3 and R3, the value of the copra is only about two-thirds that of the highest grade.

Conclusions.

(i) Copra is subject to loss and deterioration during storage and transport, unless properly prepared and promptly warehoused.

(ii) Such deterioration proceeds most rapidly at air temperatures and is reduced or checked at higher temperatures and temporarily by a film of smoke on the surface of the product.

(iii) Loss and deterioration are very considerable in the case of "raw" half-dried copra if there is delay before it is suitably bulk stored.

(iv) When there is serious deterioration, the individual pieces of copra readily break down to yield "smalls" and "dust."

Discussion.

Since the foregoing investigations reveal that half-cured copra is such an unstable and unsatisfactory product, it may seem strange that well in excess of half the world's copra is produced in this condition while, here in Malaya, much of the imported copra and some even of the copra produced in this country still continues to be of this quality. It is an unfortunate fact that such copra has a trade value and so is saleable. It offers peculiar opportunities for profit-making to the small dealer which are not realizable with a more stable and reliable copra. Where all

producers offer the same low grade of product, they cannot readily appreciate that they are not obtaining the maximum return from their palms.

It is not appreciated sufficiently, if at all, that not only are deterioration, previous to, during, and immediately after production, and the moisture content taken into account in the prices paid by local traders for "mixed" copra but also that the ruling or basic price, paid in any one district, is a reflection of the ultimate general quality of the copra from that particular district, and includes adequate compensation to the dealer to discount all loss and deterioration which normally occur with such copra during transport and storage subsequent to production.

Small dealers have never been found willing to encourage the production of a stable and reliable product as they claim that small lots of such copra are of little use to them. In those districts where a market for low-grade "raw" copra is firmly established it is therefore quite useless for an individual small producer to make drier and better copra, since he then obtains less copra, which is nearly always paid for only at the current local price. The most he can ever expect in return for his extra trouble is a price strictly proportionate to the reduction in moisture content but this allows no extra profit whatever for improved appearance and quality.

The best copra is usually made and the best local prices are paid in the immediate neighbourhood of the export centres and the oil mills. This is because little time normally elapses between production and storage in bulk, and thus any "raw" copra which may be produced will not seriously deteriorate subsequent to sale. It is thus possible for a high standard of quality to be established, and in such circumstances low-grade copra is exceptional and is likely to be penalized if offered.

The worst copra is usually produced in the more inaccessible regions whence parcels can be shipped only at irregular or long intervals, with consequent long delay before bulk storage. Despite the desirability of producing only dry copra in such regions, there is here, as elsewhere, an unfortunate natural tendency for the quality of copra produced to decline during periods of low or falling prices, particularly the latter, since drying is then liable to be curtailed so as to obtain a greater weight of copra or to make a quick sale while prices are still high.

This is a trend which it is not easy to reverse for it is not reasonable to expect individual producers to lose money by producing copra which is above the local standard of quality and dryness. It is frequently stated that producers are apathetic but it would be more correct to say they are helpless in the face of existing trading conditions.

Acknowledgment.

The writer wishes to acknowledge the assistance of the East Asiatic Co. Ltd., Singapore, in the above investigation.

Received for publication 12th September, 1939.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

3rd Quarter, 1939.

*Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S.,
in collaboration with the Field Branch of the Department.*

Rainfall.

July and August were very dry months and conditions approaching to drought existed in many parts of the country. The wet season commenced earlier than usual, September rains being generally above average.

Prices.

Tables I and II summarize prices paid for small-holding rubber during the quarter.

Uncoupons rubber improved considerably in value, rising from between \$7 and \$8 per picul in July and August to \$16 to \$20 in September. Coupon values varied considerably, but generally were lower in value at the end of the quarter. In Kelantan coupons rose from \$22.75 per picul equivalent in July to \$30 in September. In Perak South, however, while coupons rose from between \$25.50 and \$27 in July and August to between \$33 and \$36 early in September, they fell by the end of that month to \$23 to \$24. Other reports also indicate that coupon values fell at the end of the quarter.

Production and Quality of Rubber.

Production of rubber on small holdings during the year is summarized in Table III. Production for the quarter was nearly 39 per cent. of the total production for the same period, or equivalent to the ratio small holdings bear to the total planted acreage of Malaya.

In Kelantan, Instructors and Demonstrators have continued to be fully employed on smoke-house construction and in demonstrating the production of better quality sheet. There are 25 smoke houses under construction, and a further 24 awaiting construction.

In Perak South two new smoke cabinets are under construction, one being built in connexion with a new co-operative marketing society which has recently been formed.

The Malacca report states that much improvement can be seen in sheet manufacture due to the advice of Asiatic Rubber Instructors.

General Conditions on Holdings.

In Pahang it is reported that greater interest is being taken in the upkeep of holdings, particularly with respect to cover crops and soil wash. The interest in cover crops is most clearly seen where new planting and replanting is being carried out.

Table I.
Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul of 133 1/3 lbs.)
3rd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
				JULY					
Smoked sheet	33.00-37.00	32.00-36.50	32.20-32.90	33.50-36.00	31.00-36.25	35.00-37.00	32.70-37.00	31.50-35.00	34.50-35.50
Unsmoked sheet	32.00-36.00	30.00-34.70	30.00-35.00	32.00-35.00	30.00-34.50	34.00-36.00	32.30-32.80	31.50-35.30	32.50-33.00
Scrap	24.00-25.00	27.00-28.00	26.20-27.40	—	—	29.00-31.50	26.00-28.50	26.50-30.50	24.00-25.00
				AUGUST					
Smoked sheet	33.00-37.00	32.75-36.00	32.00-36.00	34.00-36.30	31.50-35.80	34.50-37.15	33.60-37.40	32.00-35.50	31.00-34.00
Unsmoked sheet	32.00-36.00	30.75-35.00	30.00-34.90	32.00-35.20	30.50-34.50	33.50-35.80	30.00-36.20	30.10-35.50	29.00-31.50
Scrap	24.00-25.00	27.00-28.00	26.25-27.50	—	—	28.00-30.50	26.00-29.00	26.20-31.00	23.50-26.00
				SEPTEMBER.					
Smoked sheet	37.00-52.00	33.60-47.00	34.00-47.30	35.00-47.00	33.20-46.30	42.50-46.00	34.00-48.00	33.00-48.00	37.00-42.00
Unsmoked sheet	35.00-51.00	32.00-45.25	33.30-44.00	33.00-45.00	34.00-41.50	40.50-44.00	31.80-46.60	31.00-49.00	35.00-38.00
Scrap	24.00-31.00	32.00-35.00	27.00-37.00	—	—	30.50-35.00	28.00-35.00	24.00-34.75	30.00-33.00

Table II.
Mean of Highest and Lowest Rubber Prices Paid by Local Dealers
at a number of Centres in each State.
(In Straits dollars per picul of 133 1/3 lbs.)
3rd Quarter 1939.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore	Kelantan
Smoked sheet	34.20-36.35	33.83-35.16	34.18-35.47	JULY 34.22-35.40	33.27-35.17	35.77-36.50	33.90-35.70	33.65-35.21	34.50-35.50
	33.50-35.45	32.04-33.55	32.50-33.73						
	24.00-25.00	27.00-28.00	26.20-27.40						
Unsmoked sheet				33.10-34.27	32.08-33.58	34.50-35.50	32.60-34.30	32.98-34.28	32.50-33.00
Scrap				—	—	29.67-30.50	27.17-28.17	27.56-28.97	24.00-25.00
Smoked sheet	34.25-36.50	34.08-35.30	34.27-35.52	AUGUST 34.34-35.66	33.73-34.90	35.50-36.05	34.40-36.13	34.00-35.18	31.00-34.00
	33.12-35.00	32.60-33.87	32.15-33.48						
	24.00-25.00	27.00-28.00	26.25-27.50						
Unsmoked sheet				33.00-34.34	32.86-33.62	34.17-34.93	31.97-34.50	32.82-34.50	29.00-31.50
Scrap				—	—	29.00-29.83	26.90-28.23	27.61-28.84	23.50-26.00
Smoked sheet	41.00-48.85	37.27-44.28	38.47-44.22	SEPTEMBER. 37.10-45.30	36.31-43.69	43.83-44.67	36.20-46.00	37.63-44.73	37.00-42.00
	39.00-46.50	35.06-41.36	35.83-40.20						
	26.32-29.32	32.00-35.00	27.00-37.00						
Unsmoked sheet				35.90-42.30	34.96-40.30	42.07-42.83	34.30-43.03	36.50-42.94	35.00-38.00
Scrap				—	—	31.67-33.17	28.33-33.00	28.19-32.09	30.00-33.00

Table III
Production of Rubber on Small Holdings.
(in tons)

	Total Jan. to Sept. 1938	1st Quarter 1939	2nd Quarter 1939	3rd Quarter 1939	Total Jan. to Sept. 1939
Federated Malay States ...	44,241	10,875	9,729	18,601	39,205
Straits Settlements ...	7,951	2,123	2,054	2,888	7,065
Unfederated Malay States ...	41,427	11,450	10,562	17,347	39,359
TOTAL MALAYA ...	93,619	24,448	22,345	38,836	85,629

In Perak the slashing of undergrowth and digging of drains have been carried out on many small holdings. It is also reported that *lalang* grass has been dug out on some Chinese and Indian holdings in Upper Perak.

Tapping.

Tables IV and V, which summarize the results of the quarterly survey of small holdings, show clearly the considerable increase in tapping which took place at the end of the quarter. A large number of holdings were brought into production which had not been tapped for some considerable time. Some reports indicate that tapping was very restricted during the months of July and August.

Planting.

Small-holders have shown less interest in replanting in some districts due to the higher prices now ruling. Small-holders were also deterred from proceeding with replanting by rumours which unfortunately became current in many localities that rubber regulation was being terminated and that, therefore, there would be no coupon issue during the growth period of replanted rubber.

The Pahang report states that, owing to the heavy rush of applications for new planting, a number of small-holders will have to wait until 1940 before completing felling and planting.

All reports indicate that small-holders are taking steps to secure budded material for new planting and replanting.

Pests and Diseases.

The wet weather in September encouraged the spread of Mouldy Rot, but the usual methods of control were satisfactorily applied.

Table IV.
Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less
than 100 Acres at the end of September, 1939.

PERAK					SELANGOR					NEGRI SEMBILAN					PAHANG				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage	
Batang Padang	36,187	8,700	24		Klang	16,143	4,400	27		Seremban	23,639	19,800	84		Raub	10,534	8,700	83	
Kinta	38,874	5,800	15		Kuala Langat	23,881	5,500	23		Tampin	21,856	14,900	68		Kuala Lipis	15,457	3,300	21	
Kuala Kangsar	92,166	30,400	33		Ulu Langat	45,012	8,600	19		Kuala Pilah	31,832	12,700	40		Bentong	12,224	3,000	25	
Upper Perak	15,590	4,100	26		Ulu Selangor	34,463	11,300	36		Jebebu	9,097	1,400	15		Other Districts†	40,373	18,100	39	
Larut & Selama	43,132	3,500	8		Kuala Lumpur	20,277	9,700	48		Port Dickson	11,133	8,700	78						
Krian	9,408	7,500	80		Kuala Selangor	8,417	3,800	45											
Lower Perak*	26,735	8,800	33																
Dindings	9,873	7,300	74																
	271,065	76,100	28			145,193	43,300	30			97,597	57,500	59			84,588	33,100	39	
MALACCA					PENANG & P. WELLESLEY					SINGAPORE					JOHORE KEDAH KELANTAN PERLIS TRENGGANU } ‡				
District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage		District	Total Tappable area	Total untapped area	Percentage						
Central	14,093	6,800	49		North	3,549	500	15		Singapore	20,115	800	4			350,007	66,500	19	
Alor Gajah	30,838	13,200	43		Central	10,785	5,300	49								102,126	27,500	27	
Jasin	25,286	5,100	20		South	8,935	400	5								49,133	9,300	19	
					Penang	15,822	300	2								2,916	800	28	
																29,836	8,400	28	
	70,217	25,100	36			39,092	6,500	17											

The percentage of areas out of tapping in June, 1939, was as follows:—Perak 50, Selangor 59, Negri Sembilan 79, Pahang 48, Malacca 48, Penang and Province Wellesley 38, Singapore 6, Johore 26, Kedah 42.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

‡ Estimated from percentage for rest of Malaya.

Table V.
Comparisons of Areas of Rubber Small Holdings Out of Tapping

	September, 1938		June, 1939		September, 1939	
	Acres	Per-centage	Acres	Per-centage	Acres	Per-centage
F.M.S. ...	274,800	45.9	338,100	56.4	210,000	35.0
S.S. ...	42,800	33.0	49,800	38.5	32,400	25.0
U.M.S. ...	137,600	25.7	155,400	29.1	122,600	21.0
Malaya ...	455,200	36.0	543,300	43.0	355,000	28.0

Oidium Heveae was recorded on many small holdings in Bentong, Pahang, during refoliation after unusually severe secondary "wintering." The Pahang report also mentions that greater attention is now being paid by small-holders to soil erosion than formerly.

Root diseases are common in many parts of the country, but it is often difficult to persuade small-holders to take the necessary steps to eradicate them.

In Perak South termites attacked a small-holders' co-operative nursery of budded stumps, causing the death of approximately 275 out of 700 plants. The same report states that a severe infestation of cockchafers occurred on a collection of small holdings. The area is under observation.

General.

In Selangor three sales, totalling 53 piculs of rubber, were made from the co-operative smoke-house at Ijok. With the increase in prices interest in co-operative sales has decreased.

In Johore the sale of latex by small-holders has been extended to other districts. In some localities sales of latex ceased towards the end of the quarter as small-holders considered that they would obtain a better price for sheet rubber.

In Kuantan District, Pahang, sheds to house coagulating equipment are being erected. The same report states that the co-operative purchase of coagulants (through the Asiatic Rubber Instructor or local co-operative society) is gaining favour in view of the difficulty small-holders are experiencing in obtaining acid from local shops.

Several reports comment on the increase in the price of formic acid and shortage of supplies. The price has risen from 50 cents to \$1 to \$1.30 per pint, and in Kelantan shortage of supplies has tended to make small-holders revert to the use of alum, of which supplies are more or less normal. In parts of Perak the price of empty kerosene tins, and hence that of coagulating pans, has increased by approximately 100 per cent.

QUARTERLY REPORT ON THE MALAYAN PINEAPPLE CANNING INDUSTRY.

June to August, 1939.

*Prepared by the Economics Branch of the Department of Agriculture, S.S. & F.M.S.,
from Reports of the Field Branch.*

Factories.

The total number of registered factories stated in previous reports has referred only to actual canning establishments. Under the law, however, peeling sheds also are considered and described as registered factories; hence to avoid confusion the position might be summarized thus: the total number of registered factories is twenty; of these, three are peeling sheds only, one is a factory used solely as a peeling shed, while the remaining sixteen are canning establishments proper. Of the sixteen factories proper, ten only were operating during the latter half of the main pineapple season, which ended in August; of these, five were in Johore, four in Singapore and one in Selangor. The other registered factories were not working owing to the quota restriction scheme and instead sold their quota to operating factories through the Central Board. The registration of one non-operating Singapore factory was cancelled during the quarter under review because the firm was not a member of a recognized association.

Production and Sales.

The Central Board's production quota for the season 1st April to 30th September, 1939, was originally fixed at 1,000,185 cases but in June this was increased to a total of 1,200,445 cases, while individual packers were allowed a permissible excess not exceeding 5 per cent. without penalty.

The increase in quota was intended to meet an anticipated decrease in pack due to decreased fruit supply during the next quota year and to make it possible to carry out selective packing so as to be able to fulfil requirements under outstanding contracts for "golden" qualities. A surplus of fruit also made it imperative to increase the quota, if reasonably possible. The total production for the April—September season ultimately amounted to 1,277,298 cases, and an increase in reserve stock was duly secured.

Total exports of canned pineapples from this country for the quarter under review amounted to 21,810 tons and were valued at \$2,528,974. Monthly exports for 1939 up to the end of August were as follows:—

Month		Quantity tons	Value \$
January	...	4487.16	507,122
February	...	6888.83	754,314
March	...	7615.69	844,686
April	...	9276.73	1,025,524
May	...	10224.34	1,164,226
June	...	8207.56	941,756
July	...	7928.76	921,009
August	...	5673.53	666,209
Total	...	60,297.62	6,824,846

Canned and Fresh Fruit Prices.

Prices in Singapore per case of 48 cans of 1½ lbs. each as fixed by the Central Board during the three months under review remained unchanged at the following prices in Straits dollars:—

	General Average Quality (G.A.Q.)	Golden.
Sliced Flat	... \$3.20	\$3.60
Sliced Tall	... 3.35	3.75
Cubes	... 3.25	3.65

Prices per 100 of fresh fruit varied as follows:—Singapore 50 cents to \$2.10, Johore 50 cents to \$2, Selangor 58 cents to \$1.10, depending on size, quality and on place of sale, *i.e.* whether at factory or in field.

There was considerable activity between growers and packers' representatives and officers of the Department of Agriculture with a view to settling questions concerning fresh fruit prices in the field, standards of quality and the like. Proposals based on the recommendations of an informal committee in this connexion are at present under consideration by the Central Board.

Government Research Station and Canning Factory.

Several full-scale demonstration runs were arranged for the benefit of packers, shippers and others connected with the canning industry. These aroused great interest.

Research during the period under review has been concerned with the Sarawak pineapple, pineapple juice and can-closing machinery. The findings may be summarized as follows:—

- (a) The Sarawak pine can be canned satisfactorily by the ordinary exhaust and open tank cook process as recommended for use with the Singapore Canning pineapple. The Sarawak pine is very suitable for canning; it gives less waste and when properly canned may be claimed to have an appearance and flavour closely resembling that of the Hawaiian product. Compared with the Singapore fruit, it is stated to possess a superior flavour though the colour is not of such a light golden shade.

- (b) There are preliminary indications that the technique of preparation has a greater effect in controlling the flavour of pineapple juice than does the type of fruit used. Work is in hand to discover how the flavour and colour may be improved.
- (c) It has been established that the fully automatic can-closing machine cannot be recommended for use in conjunction with local hand-made cans. A comparatively high proportion of damaged and leaky cans results from this combination. Further trials using combinations of machine and hand-made cans together with hand and fully automatic closers are in progress.

General.

Reports from Singapore indicate that many of the older areas under pineapples have gone out of cultivation or have been planted with other crops, but several small new areas have been planted recently. The exact area under pineapples at the end of the period under review is not known, but is under investigation. The greater part of the fruit canned in Singapore continued to be drawn from Johore. Selangor reports indicate that there was no new planting during the quarter, though there was very heavy fruiting in producing areas.

Abstracts.

REPORT ON A VISIT TO MALAYA, JAVA, SUMATRA AND CEYLON

BY

SIR FRANK STOCKDALE, K.C.M.G., C.B.E.

Agricultural Adviser to the Secretary of State for the Colonies.

THE NETHERLANDS INDIES.

Following his visit to Malaya,* Sir Frank Stockdale visited Java and Sumatra with the object of studying at first hand the agricultural methods in vogue in those countries and the organizations which have been built up for research and advisory services. His report, due to certain exigencies, is limited to those items which would appear to be of the greatest interest to agriculturists in the Colonial Empire at the present time.

Soil Problems.

The outstanding impressions received as a result of the visit to the Netherlands Indies were the importance which was attached by all to soil conservation and the maintenance of soil fertility. In Java, the measures taken to conserve soil and preserve its fertility have already reached a high standard. These measures have been necessitated by the density of the population and have been favoured by the natural richness of many of the island's soils; they consist chiefly of the extensive use of irrigated terraces, supplemented by forest reserves on the higher slopes of mountains, while shade trees and green manures are widely employed. Forests represent about one quarter of the total area of the island, while terraced "sawahs" account for $3\frac{1}{4}$ of the $7\frac{3}{4}$ million hectares occupied by small-holders. While many of these are irrigated by primitive means, the majority are irrigated from an elaborate and extensive system of dams and reservoirs, a noteworthy feature of which is the excellent control organization. Water containing injurious constituents is diverted and allowed to run to waste, while that containing silt or soil fertilizing agents is carefully distributed by the irrigation system, thus helping to maintain soil fertility.

In the Outer Provinces (Sumatra, Borneo, Celebes, etc.) the position is less satisfactory. Compared with Java, the soils are less fertile while the density of the population is only about one-tenth as great. Shifting cultivation, with all its disadvantages, is the rule on a very large proportion of the agricultural land and the Government is now contemplating a more active forest policy and the development of irrigation schemes with a view to correcting the erosion and loss of fertility in these areas.

Estates both in Java and Sumatra pay particular attention to soil conservation. The use of ground cover, consisting either of cover crops or of selected soft weeds,

* See *Malayan Agricultural Journal* for September, 1939.

is general; contour drains and silt pits are commonly employed, while terraces are used in certain localities. The early application of such methods may possibly be attributed in part to the fact that a very fair proportion of estate managers and assistants in the Netherlands Indies have received prior to their appointment the full agricultural training, with specialization in tropical agriculture, provided at the Agricultural College at Wageningen in Holland.

Experiment Stations.

Agriculture in the Netherlands Indies has been well served by its Experiment Stations. Work for peasant agriculture has been centred at the General Agricultural Experiment Station, Buitenzorg, which is maintained from Government funds. This Station has also carried out important work for estate agriculture, but this work has been increasingly transferred where practicable to the Experiment Stations maintained by crop interests—a chain of which provide research and advisory services for the rubber, tea, coffee, cacao, cinchona and sugar industries.

The work of these Stations is described and Sir Frank Stockdale feels that his observations made in regard to cinchona and sisal may be of particular value to British Colonial interests.

The high standard of agricultural research work in the Netherlands Indies is almost proverbial and the importance which has been and still is attached there to crop improvement by plant breeding is particularly noteworthy. Not only have plantation crops been improved, but most valuable work has been done in connexion with food crops and in the evolution of strains of plants resistant to various pests and diseases. The valuable co-operation offered by the scientifically-trained estate personnel has been of considerable assistance to the plant breeders in their efforts to improve plantation crops.

The British Colonial Empire can learn much from the achievements of the Dutch in the Netherlands Indies and it is clear that greater emphasis should be given in future to the work which can be performed by plant breeders for the development of tropical agriculture. The number of plant breeders in Colonial Departments of Agriculture is clearly too small if progress is to be maintained or its rate improved.

Agricultural Education.

Agricultural education has received considerable attention in the Netherlands Indies. The Agricultural High School at Buitenzorg provides a very thorough three years course in agriculture and forestry, in which considerable emphasis is placed not only on agricultural subjects *per se* but also on building construction, irrigation, motor and electrical engineering, and surveying. The diploma of this School is accepted for entry into the extension services of the Department of Agriculture, the Forest Service, and the plantation industry, and the average of 20 students who leave each year usually find little difficulty in obtaining employment.

The Secondary Agricultural School at Malang also provides a three years course in agriculture and forestry and an additional fourth year for those students who intend to seek employment in the plantation industry. This fourth year is devoted to theoretical and practical mechanics, construction, general and electrical engineering, and work of a similar nature. From 40 to 50 students leave the School each year.

A system of Farm Schools was started some years ago for boys selected from the highest standards of elementary schools. Emphasis is placed on practical aspects of agriculture and the object is to provide a sound agricultural training for the sons of small-holders, with a view to raising the standard of village agriculture. Owing to the fact, however, that there is no spare land in Java for the pupils to occupy and that little improvement has been noticeable in agricultural methods after the return of these trained pupils to their homes, it has been decided gradually to abandon the Farm School system in Java, and to provide for the introduction of agriculture into the curriculum of selected rural elementary schools instead. The Farm School may prove more successful in the Outer Provinces, particularly where colonization is practicable or under contemplation.

Facilities exist for training selected teachers from the rural schools in theoretical and practical agriculture. The sixth year at such elementary schools is, in the case of selected pupils, devoted to the rudiments of village agriculture, while the agriculturally-trained teachers also give village courses once or twice a week to such cultivators as desire to attend them.

Credit Facilities.

Credit facilities are provided in the Netherlands Indies through the People's Bank, Village Banks, Padi Banks and Co-operative Societies.

The People's Bank has seventy branches and is mainly used by the urban worker. There are 7,000 Village Banks and these are largely used by petty traders and urban communities generally, while Padi banks, of which there are also 7,000, provide credit facilities for the rural population.

These Padi Banks advance three loans of uniform amount to the padi cultivator each season; the first is made at the time of cultivation, the second at transplanting and the third just before harvest. Stores are provided for the padi after harvest, and from the padi deposited therein by the cultivators refunds of the loans issued are made. Both loans and the interest thereon may be repaid in kind, *i.e.* in padi.

There are also some 400 Co-operative Societies. They have been found most effective in those districts where the members have attained a certain degree of education and business knowledge, and are frequently associated with the existence of national spirit on the part of members. The credit thus provided is hence largely urban, though it is held that co-operative societies for providing rural credit may also make sound progress where a combination of education and business sense exists. Attempts are being made in some rural districts where indebtedness is general to liquidate the latter over a period of years *via* the medium of "relief"

co-operative societies. Such societies are undoubtedly meeting with a measure of success though it is yet too early to say whether this method of dealing with rural indebtedness will be generally successful.

It will be noted that the co-operative movement is almost entirely concerned with credit. Marketing societies have not up to the present been attempted as the very numerous petty traders would probably offer too keen competition for them to succeed.

CEYLON.

The three major agricultural industries of the island—tea, rubber and coconuts—have now each a separate Research Institute or Scheme. These are firmly established and doing most useful work for the industries for which they were created, while the establishment of these separate institutes has enabled the Department of Agriculture to pay greater attention to the needs of those growing padi and other secondary crops and to the agriculture of the peasant small-holder generally.

Tea Research Institute.

The Tea Research Institute was founded in 1925 and has performed useful research in all phases of the tea planting industry. An advisory service for tea-growing small-holders has also been evolved, with a result that considerable improvement is already apparent.

Soil erosion is a serious problem in many tea-growing districts and is receiving considerable attention from the staff of the Institute. Investigational work is now being performed on the decomposition of plant materials, the effect of covers on yields, and the value of green manures in tea cultivation.

The practice on some estates of removing all plant debris and leaves from the soil surface, with the object of making compost, is to be deplored. Large areas of bare soil exist as a result of this practice, with consequent erosion and deterioration, and it is hoped that definite efforts will be made by all concerned to effect improvement generally in this connexion throughout the tea growing districts.

Rubber Research Scheme.

The standard of agricultural and technological research conducted under the Rubber Research Scheme is very satisfactory. The major activities are concerned with the selection and testing of improved planting material, the prevention of soil erosion on hilly land, and the use of cover crops. Oidium leaf fall disease, which is now common, is receiving attention, and while sulphur dusting is held to be an economic control measure, it is suggested that the real long-range view in regard to this disease must be the evolution of strains of rubber resistant or immune to the disease.

The prospects of developing rubber-manufacturing industries in the island are not encouraging, but it is suggested that attention should be given in Ceylon, as it has been in India and the Netherlands Indies, to the development of rubber-tired wheels on bullock carts, which are still largely employed for transport purposes. A local outlet for rubber might thus be created.

Coconut Research Scheme.

The work under the Coconut Research Scheme is well organized and is appreciated by an ever increasing circle of producers. It has consisted largely of technological investigations in regard to copra, soap-making, the utilization of coir fibre, crop improvement, and manuring, including the use of green manures. A further critical study of the mechanism of coconut pollination under Ceylon conditions appears to be desirable in view of the difference of opinion which appears to exist in this connexion between the investigators in Malaya, Ceylon and South India.

Department of Agriculture.

The work of the Department of Agriculture is now largely concerned with those crops, other than tea, rubber and coconuts, which are of common or potential occurrence in peasant small-holding agriculture. The work has been largely educational and has paid special attention to padi, fruit cultivation, cacao, cotton, castor, cashew, chilli, citronella, coffee, sesame, eleusine and tobacco. Very considerable progress has been made with fruit growing, especially with citrus, and stock and manurial trials are being carried out with grapefruit, oranges and mandarines. Mangoes, pineapples, and fruit-canning also are receiving attention.

While satisfactory advances have been made with animal husbandry and poultry keeping, and with recent attempts to interest small-holders in soil conservation, it is felt that insufficient work is being done in connexion with the padi crop. For a period, selection work ceased, and since there can be no doubt that Ceylon should produce more of its rice-requirements the recent appointment of a Padi Specialist is commended. Co-operation is progressing slowly, while small-holders hold in high esteem the work of the Department concerned with agricultural marketing.

In conclusion, it is encouraging to see the developments in agricultural research and the interest that is being taken in their practical application, and while much remains to be done it is satisfactory to record that considerable efforts have been made in Ceylon by means of advisory services, propaganda and education to interest all, including small-holders, in the measures which can be taken to improve that island's standard of agricultural practice.

D.

LEGISLATION AND THE COCONUT INDUSTRY IN THE PHILIPPINES. *

Historical.

Sovereignty over the Philippines was ceded by Spain to the United States in 1899. From the very beginning, American policy has been to enlarge Philippine autonomy with political independence as its final goal, but on the other hand increasingly stronger economic ties have been made to bind Philippine economy to that of the United States. From 1913 onwards, for instance, unrestricted free trade was practised between the two countries, one result of which was a tendency to draw Philippine export staples away from the various competitive world markets towards the more profitable protected American market. In 1937, for example, 82 per cent. of the total Philippine exports were to the American market, a market which has absorbed nearly all the exported coconut oil and desiccated coconut products, and three-quarters of the copra exports.

The Independence Act, 1934.

The year 1934 marked the beginning of a period of restrictions. The Independence Act placed restrictions upon the quantities of certain Philippine agricultural products, including coconut oil, which may enter the United States free of duty. The duty-free quota permitted in the case of coconut oil, for instance, was limited to 200,000 long tons. To help industries dependent on the American market to adjust themselves to a non-preferential status after independence, the Act provides for the imposition by the Philippines of progressively graduated export taxes upon Philippine products shipped to the United States. These taxes commence in 1940 and increase by 5 per cent. per annum of the United States duties to reach a maximum of 25 per cent. thereof in 1945; their proceeds are to be used solely in the retirement of the Philippine bonded debt. Finally, the Act implies that after July, 1946, following the granting of political independence, Philippine export products will be subject to full duties under the American tariff.

Other restrictions have since been imposed. The United States Revenue Act of 1934 and subsequent legislation, for instance, imposed an excise tax of 3 cents per lb. on Philippine coconut oil whether processed in the Philippines or in the United States. The proceeds of these and similar taxes are being remitted to the Philippine treasury for economic adjustment purposes, but this practice will of course cease when independence is attained in 1946.

Anticipated Effects on the Philippine Coconut Industry.

The economic provisions of the Independence Act, principally, the graduated export taxes, together with the United States Revenue Acts of 1934-36, will have a

* Abstracted from "The Report of the Joint Preparatory Committee on Philippine Affairs and Proposed Amendments to the Economic Provisions of the Independence Law", by Jose E. Velmonte, published in the *Philippine Agriculturist*, Vol. XXVIII, No. 5, October, 1939.

profound effect on the exportation of all Philippine coconut products to the United States, but their severity has been mitigated somewhat by the legislation described later in this summary.

Under the Independence and Revenue Acts, the duty-free quota for coconut oil is 200,000 long tons, an amount somewhat larger than normal exportation. All other coconut products are not similarly restricted. From 15th November, 1940, however, progressive export taxes will apply to coconut oil, copra cake and meal, and desiccated coconut. Copra being on the "free list" has never enjoyed any protection and it will not likely suffer from any adverse effects.

The coconut oil industry competes with a similar industry in the United States. About 50 per cent. of the coconut oil consumed in the United States is produced by Philippine mills, the remainder being supplied by domestic mills using Philippine copra almost exclusively. The imposition of export taxes will affect seriously the coconut oil trade. Philippine and American mills obviously buy Philippine copra on the same price basis, and any advantage local mills may have over United States mills must be found in the relatively small cost of crushing copra which is estimated to be less than $\frac{1}{2}$ cent per lb. Philippine producers maintain that there is hardly any advantage; hence, the imposition of 0.1 cent export tax during the sixth year of the Commonwealth will prove crucial to the local oil industry, as the margin of profit present is estimated to be from $\frac{1}{8}$ to $\frac{1}{10}$ cent per lb. By the seventh year of the Commonwealth, the export tax of 0.2 cent per lb. will far exceed present profits and, therefore, will liquidate the business. The probable result, therefore, will be to transfer the crushing industry from the Philippines to the United States. This will mean also the loss of copra meal and cake as an export.

There is, however, a compensatory gain in that copra exports should increase by an amount approximately corresponding to the loss of coconut oil. Desiccated coconut will be subject to export taxes, the full duty at present being 3.5 cents per lb. United States' imports in recent years are largely from the Philippines, representing about 97 per cent. of the total. It is the belief that trade in this product will not be very seriously affected by export taxes since, even in the tenth year of the Commonwealth with an export tax of 0.875 cent, the remaining tariff preference over the Ceylon product will still be over 2.6 cents. After independence, the effect is problematical; the belief is that it will be able to retain a large fraction of the American market despite the duty.

The U.S. Revenue Acts of 1934, 1935, and 1936 impose an excise tax on Philippine coconut oil, whether processed in the Philippines or in the United States, of 3 cents per lb., and on foreign coconut oil of 5 cents. While there is a tax preference in favour of Philippine oil, many domestic oils which are competitive are tax exempt, and many of these oils when imported from foreign countries pay excise taxes not higher than 3 cents. Consequently, the effect of the excise on Philippine

coconut oil will be to lower its competitive position in the American market. Domestic oils have increased in price, while Philippine coconut oil has been depressed in price. The situation becomes more critical because there have sprung up new competitors which are tax exempt and some also duty-free, as for example, babassu oil.

After independence, the imposition of the non-preferential rate of 5 cents will further weaken the competitive position of Philippine oil and seriously injure the whole coconut industry. One ameliorating circumstance is that the Philippine government during the Commonwealth period will receive the proceeds of excise taxes.

The Philippine Economic Adjustment Bill.

The abrupt changes inherent in the economic provisions of the legislation described in the foregoing sections would inevitably have affected adversely a number of Philippine export industries, as well as those American industries concerned with exports to the Philippines. A Joint Preparatory Committee on Philippine Affairs was therefore created to examine the inequalities or imperfections of the Act. Its findings indicated that, while copra, being on the "free" list, would suffer no adverse effects, the other principal Philippine exports, excepting sugar and cordage but including coconut oil, would probably be destroyed by the tax. The Committee therefore recommended, *inter alia*, that trade preferences should be extended, although gradually diminished, until the end of 1960, and efforts were therefore made to have suitable legislation approved by the United States Congress.

The first omnibus Philippine Bill, incorporating all the recommendations of the Committee, met with no success hence a further emergency Bill (The Philippine Economic Adjustment Bill), which adopted only in part the recommendations of the Joint Committee, was therefore introduced as a compromise measure, and finally received the approval of Congress on 7th August, 1939. This Bill does not attempt to define United States—Philippine trade relations after the granting of political independence in July, 1946, but has as its main objective the relief of those Philippine industries which would otherwise have been adversely affected by the imposition of export taxes after 1940. The salient provisions of the Bill in so far as the coconut industry is concerned are as follows:—

(a) Export taxes are to be assessed on Philippine products entering the United States beginning 1st January, 1941, at 5 per cent. of United States duties on such goods, increasing progressively by 5 per cent. on every 1st January until they reach a maximum of 25 per cent. on 1st January 1945. Provided there is no change in the United States tariff Philippine (and other) copra will continue to enter that country on a duty-free basis.

(b) 200,000 long tons of coconut oil will be exempted from export taxes during 1940, the duty-free quota to be diminished by 5 per cent. on every succeeding 1st January until 4th July, 1946. Exports in excess of quota will be subject to full duty.

(c) The proceeds of Excise taxes on coconut oil are to be refunded to the Philippine Government, and these proceeds after 1st January 1959, are to be freed from previous restrictions in such a way as to permit expenditure for providing facilities for better curing of copra and for *bona fide* production loans to Philippine copra producers. This is considered a great victory for such producers, since it represents a reversal of the previous conditions which prevented them from obtaining any direct benefit from coconut excise taxes, and prohibited the proceeds of such taxes from being used to subsidize the coconut industry.

Finally, the Bill provides that at least two years before independence is granted (4th July, 1946) a joint United States—Philippine conference shall be convened to formulate recommendations as to future trade relations between the United States and the independent Philippine republic.

D.

Departmental.

FROM THE DISTRICTS.

*Compiled in the Office of the Chief Field Officer from Monthly Reports of
Agricultural Officers.*

October, 1939.

The Weather.

During October wet weather was experienced in all parts of the country, but in most places the total rainfall did not exceed the average. In Negri Sembilan the rainfall was below normal.

There was very heavy rain in Malacca: from the 1st to 25th October more than 16 ins. were recorded at Pulau Gadong and Malacca town. Serious flooding occurred, particularly in the Malacca River valley and in the lower reaches of the Duyong River. Extensive damage was done to property and cultivation, and there were serious losses among livestock, particularly goats, pigs and poultry. The floods took a long time to subside and some rice fields were submerged for as long as 10 days: this naturally resulted in the complete destruction of the crop, but no estimate of the total loss can be made as on some areas where plants were destroyed replanting is being done.

There was also some flooding in Province Wellesley but little damage was done.

Crop Reports.

Rubber.—The price of smoked sheet remained at between \$40 and \$46 per picul. In most places smoked sheet now fetches \$3 more than the unsmoked product. Many smoke cabinets are being brought into use again. With rubber at its present price small-holders are rather less interested in replanting. During October many holdings were brought back into tapping.

The outbreak of war caused a temporary interruption in the supply of coagulating acid. This has caused particular inconvenience to small-holders who normally buy their supplies of acid by the bottle and keep no stock. Regulations were passed at the end of September to fix the selling price of coagulants in the Federated Malay States and to prevent hoarding, and similar legislation has been enacted in the Straits Settlements and is under consideration in some of the Unfederated States.

In some of the more remote districts small-holders have banded together to purchase their supplies of coagulant direct from the large importers in Singapore, Kuala Lumpur or Penang.

Padi.—At the beginning of October large tracts of padi in North Kedah began to look yellow. This condition still persisted at the end of the month. It is thought that it may be due to the severe drought which occurred after planting during the second half of August, although no ill-effects were noticeable in September when water supplies were again adequate. It is feared that the crop is not likely to be so good in the affected areas.

In spite of Puasa, transplanting has been continued on certain lots at Sungei Manik in Perak on which work had not been finished earlier.

The Government's policy to increase the area planted with padi is being pushed forward particularly vigorously in the Sungei Manik area. It is intended that the opening up of Stages IV and V should be accelerated by employing paid labour. Malays employed on this scheme who work well will have first claim to be allotted 5 to 6 acres of felled land for padi growing. Initially they will receive only a temporary occupation licence, but after 3 years, if the land has been brought into cultivation satisfactorily, a permanent title will be given. A bonus of \$10 per acre will be given to all holders who have completely cleared and stumped their land within 12 months of entering into occupation.

The present programme provides for irrigation water on Stage IV in 1940 and on Stage V in 1941.

Surplus padi from this area will find a guaranteed market from 1st January, 1940, at \$2.50 a picul at the new Government rice mill which is under construction at Teluk Anson. Good progress is being made with the building: all the machinery has been installed and it may be possible to start milling before the end of the year.

Bananas in Negri Sembilan.—Erosion on banana areas in Negri Sembilan has long been causing concern. Much of this land is very steep and the Chinese planters believe that if the plantations are not kept clean weeded the yield will be seriously reduced. Early in the year a simple experiment was put down on typical banana land to see exactly what effect the presence of cover crop would have upon the crop. The yields recorded from the three blocks of this experiment for the past 7 months show no reduction as a result of employing leguminous cover or *Mikania scandens* cover as compared with clean weeding.

Quarterly readings of soil loss are made at fixed points on the plots. The latest reading showed that at three of the six points in the clean weeded plot no wash had occurred, while at the other three points the wash varied from .3 to .5 in. At the three observation points in the leguminous cover plot no wash had occurred, but in the *Mikania* plot at the two lower points .5 in. of soil had been lost. The growth of the cover on the latter plot was initially slow and it was further retarded by the dry weather.

Food Crops.—An area of 336 acres of land at Changi near Singapore, at present planted with rubber, has been bought by Government with the object of allowing occupation of the land on temporary occupation licence for vegetable growing. Government will take possession of this land at the end of November and it is hoped that by that time applications will have been received for the greater part of the area.

Budding of Durians.

Fair success is now being obtained in budding durian at Selama Agricultural Station, Perak. The seedlings are grown rapidly in well prepared beds and budding is undertaken when the stocks are some 6 months old. Green unpetioled (semi-mature) budwood, on which the buds are somewhat swollen, is used. By employing this system much better success than formerly has been attained at this Station. Further, the budded plants, being still quite small, are more easily lifted than are older and larger plants.

RETIREMENT OF MR. B. BUNTING, N.D.A.

Mr. Benjamin Bunting, Senior Agriculturist, retired on 8th November, 1939, after more than 25 years in the Malayan Agricultural Service.

Mr. Bunting joined the Department of Agriculture as Assistant Agriculturist in March, 1914. He was promoted Agriculturist with effect from 8th March, 1920, being styled Agriculturist, Government Plantations. He was in charge of the four plantations, three rubber and one coconut, which the Federal Government owned at that time, in addition to the newly-opened Central Experiment Station, Serdang, as it was designated later. Mr. Bunting, who had experience as a planter before he joined the Department, conducted these plantations on sound and efficient lines, and the knowledge gained as a result of experiment work on the plantations was of great value to the planting industry at that time.

It is in connexion with Serdang that Mr. Bunting's name will long remain associated, and this well-laid out Experiment Station, widely known throughout the Colonial Empire, stands as a fitting memorial to his talent for organization and devotion to duty. Older members of the Department will remember his keenness and enthusiasm during the early days at Serdang, when the Station was being opened to accommodate the large collection of economic plants obtained from many parts of the tropics. Later, he was responsible for the erection of oil palm, coffee and tea factories at Serdang, all of which served to elucidate many problems arising from the preparation of these crops for market.

Consequent upon the disposal of the Government Plantations and the reallocation of work in the Division of Agriculture, the Experiment Station and Public Gardens, Kuala Lumpur, came under Mr. Bunting's charge. He took a keen interest in horticulture, and, as Honorary Secretary of the Public Gardens Committee, made many valuable horticultural introductions.

Early in 1926, the Experiment Station at Cameron Highlands was opened under Mr. Bunting's direction and he was responsible for the pioneer work at that Station.

Later the title of his appointment was changed to that of Senior Agriculturist. He acted as Chief Research Officer on two occasions and was acting in that appointment at the time of his departure.

His frequent contributions to the publications of the Department are further evidence of continuous valuable work in the realm of tropical agriculture. His most important contribution is the revised edition of "The Oil Palm in Malaya" of which he was senior joint author.

Although owing to indifferent health in recent years he has decided to retire at a comparatively early age, we hope that he will not sever his interest completely with tropical agriculture.

His colleagues in the Department and his numerous friends throughout Malaya wish Mr. and Mrs. Bunting many years of happiness in retirement.

C.D.V.G. & J.N.M.

FERTILIZER PRICES, NOVEMBER, 1939.

The following are the prices current for the month of November, 1939, of some of the more important fertilizers.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	—	80.00
Calcium Cyanamide	...	20.6	—	—	—	95.00
Muriate of Potash	...	—	—	—	50	115.00
Sulphate of Potash	...	—	—	—	48	120.00
Superphosphate (concentrated)	...	—	39	—	—	110.00
Superphosphate	...	—	16-18	—	—	65.00
Basic Slag	...	—	16*	—	—	52.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50¶
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total

¶ \$31.50 per ton ex-warehouse, Singapore.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

Statistical. MARKET PRICES.

October 1939.

Major Crops.

Rubber.—There was again considerable fluctuation in the rubber market, the maximum price variation during the month being $4\frac{1}{2}$ cents. No. 1. X. Ribbed Smoked Sheet opened in Singapore at 34 cents per lb., fell to $33\frac{1}{4}$ on the 5th October, and then rose, with minor fluctuations, to close at $37\frac{3}{4}$ cents.

The average of daily quotations for the month was 35.88 cents per lb., as compared with 35.13 cents in September. The London average price was 10.16 pence per lb., and New York 19.68 cents gold, as compared with 9.59 pence and 21.03 cents gold respectively in September.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.
Weekly Prices Paid by Local Dealers for Small-Holders' Rubber,
October, 1939.
(Dollars per picul of 133 $\frac{1}{3}$ lbs.)

Grades	Kuala Kangsar, Perak		Kuala Pilah, Negri Sembilan				Batu Pahat, Johore.			
	4	18	5	12	19	26	4	11	18	25
Smoked sheet ...	40.00	44.12	40.00	42.50	45.00	—	—	40.00	—	44.00
Unsmoked sheet ...	38.00	—	—	31.00	43.00	43.50	37.91	39.41	41.50	42.76
Scrap ...	—	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$3.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 11th and 25th October.

Palm Oil.—According to latest information available a Government controlled price of £14.15s. per ton for palm oil is still in force in the United Kingdom.

Copra.—The sun-dried grade opened in Singapore at \$3.65 per picul, but fell to \$3.50 on the 10th October and remained unchanged at that price for the remainder of the month. The Singapore average price for the month was \$3.52 per picul as compared with \$2.88 in September. The mixed grade remained 30 cents per picul lower than the sun-dried grade.

Copra cake was quoted throughout the month at \$2 per picul.

Padi.—The Government Rice Mills, Perak and Pahang, maintained their price of \$2.20 per picul for padi. The Perak mills pay a bonus of 10 cents per picul for pure strain S.K. 48 padi. Retail prices of padi per 100 gantangs (gallons) were as follows:—Kedah \$7.50; Province Wellesley and Penang \$9.75; Perak North \$12; Krian \$8.40 to \$9.40; Perak Central \$11.37; Perak South \$8 to \$11; Selangor \$10 to \$14; Pahang \$8 to \$14; Kelantan \$10.60; Johore \$11 to \$16; Brunei \$10 to \$12.

Pineapples.—Owing to the increased cost of materials, such as tinplate, sugar, and cases, the Central Board of Packers raised prices of canned pineapples during October. The new prices, per case of 1½ lbs. each, were: G.A.Q.: Sliced Flat \$4.20, Sliced Tall \$4.35, Cubes \$4.25; Golden: \$4.80, \$4.95 and \$4.85. The average prices for the month were: G.A.Q.: \$3.95, \$4.10 and \$4; Golden: \$4.50, \$4.65 and \$4.55.

Fresh fruit prices per 100 in Selangor were:—large \$1.25 to \$1.45, medium \$1 to \$1.15. In Singapore and Johore, prices of fresh fruit are now paid according to weight. In Singapore prices per 100 lbs. fresh fruit are 57 cents for fruits weighing between 1½ and 2½ lbs., and 66 cents for fruits over 2½ lbs. These prices approximate to \$1.15 and \$1.65 respectively per 100 fruits.

In Johore the corresponding prices are 46 and 53 cents per 100 lbs, respectively.

Beverages.

Tea.—No London prices are available.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 24th October, 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb:—High Grown Teas Rs. 1.07, Medium Grown Teas 94, Low Grown Teas 86.

Coffee.—Liberian coffee opened in Singapore at \$15.50 per picul, fell to \$15, and closed at \$15.50. Excelsa opened at \$10 and improved to \$10.50. Robusta was quoted throughout the month at \$7.50.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$13.19 to \$14.19 per picul, and for Sourabaya coffee \$10.19 to \$11.19. The September averages were \$9.90 to \$11.88 and \$12.69 to \$15.31 respectively.

Spices.

Arecanuts.—The Singapore Chamber of Commerce quotations per picul, which were stated to be approximate only, were:—Best \$5.75, Medium \$5.50, Mixed \$5.25.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$4.56 to \$6.62; Red Whole \$5.12 to \$6.56; Sliced \$9.19 to \$13.38, as compared with \$3.94 to \$5.44, \$4.69 to \$6.44, and \$6.56 to \$8.63.

Pepper.—Quotations in Singapore were lower during the month, and average prices per picul were: Singapore Black \$8.25, Singapore White \$14.25, Muntok White \$14.62, as compared with \$8.65, \$14.05 and \$14.70 in September.

Nutmegs.—Only quotations at the close of the month are available and these are, per picul: 110's \$32; 80's \$40. In September quotations were \$24.50 and \$28 per picul respectively.

Penang dried nutmegs were sold at \$19.50 per picul.

Mace.—No quotations are available. The September prices were: Siouw \$85 per picul nominal; Amboina \$46. Locally produced mace, dry, was sold in Penang at \$70 per picul.

Cloves.—No quotations are available. September nominal quotations were \$40 per picul for both Zanzibar and Amboina.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 23rd October, 1939, from Rs. 1.45 to Rs. 1.52 per lb.

Miscellaneous.

Derris.—There was little material change in the Singapore market during October, except that prices stiffened slightly. In many cases heavy rains interfered with cropping, and supplies consequently reached the market in small parcels only.

Roots sold on a basis of ether extract remained unchanged at \$9 to \$10 per picul, but roots sold on rotenone content averaged \$20 to \$22 per picul as compared with \$18 to \$20 in September.

Gambier. Block was not quoted, and Cube No. 1 was quoted throughout the month at \$17 per picul. September prices were: Block \$8 nominal, Cube No. 1 \$17.

Sago.—Prices in Singapore fell during October. Pearl opened at \$10 per picul and fell to \$7.50, averaging \$8.12. Flour, Sarawak Fair, opened at \$7 and closed at \$5.50, averaging \$5.81. The September average prices were \$7.90 and \$5.71 respectively.

Tapioca.—Prices remained high. All grades opened at \$9 per picul, fell to \$8.25, but closed at \$9 again, averaging \$8.62. September average prices were: Flake Fair \$6.87, Seed Pearl \$6.95, Medium Pearl \$7.05.

Tobacco.—The general range of prices of dried leaf per picul was: 1st quality \$20 to \$36; 2nd quality \$10 to \$30; 3rd quality \$5 to \$25. In Malacca the range was \$36 to \$40, and in Johore \$12 to \$38. Prepared tobacco in Johore ranged from \$40 to \$144. In Kelantan the range of prices of prepared tobacco was: 1st quality \$85 to \$170, 2nd quality \$60 to \$135, 3rd quality \$40 to \$115.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER, 1939.

PRODUCT	Net Exports in Tons				
	Year 1938	Jan./Sept. 1938	Jan./Sept. 1939	September 1938	September 1939
Arecanuts ...	33,769	27,926	30,798	1,543	5,684
Coconuts fresh †† ...	116,743†	76,907†	73,125†	8,398†	6,876†
Coconut oil † ...	49,140	33,574	44,972	4,759	5,449
Copra † ...	68,754	37,879	38,806	9,611	4,316
Copra cake ...	7,112	1,208	7,352	104	1,188
Gambier, all kinds ...	1,632	5,004	1,197	376	143
Palm kernels ...	9,359	6,292	7,227	880	730
Palm oil ...	54,377	41,999	41,959	6,353	2,623
Pineapples, canned ...	73,168	59,987	66,228	4,949	5,931
Rubber ¶ ...	360,898¶	283,324¶	253,793¶	25,831¶	35,178¶
Sago,—flour ...	4,537	3,395	4,663	1,044	854
„ —pearl ...	4,203	3,181	2,876	420	546
„ —raw ...	5,088*	4,020*	3,768*	463*	565*
Tapioca,—flake ...	981	687	779	56	204
„ —flour ...	3,072*	2,390*	1,852*	148*	44
„ —pearl ...	17,818	13,441	13,963	1,598	2,735
Derris ...	676	407	912	71	186
† Copra equivalent ...	150,944	93,975	113,847	17,512	13,307

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939.	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,123.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
August ...	3,613.2	3,004.2	6,617.4	680.8	554.0	1,234.8
September ...	3,260.9	1,625.8	4,886.7	651.2	276.0	927.2
Total ...	22,877.2	19,607.8	42,485.0	4,204.9	3,299.1	7,504.0
Total January to September, 1938	21,420.4	15,705.4	37,125.8	3,775.2	2,597.0	6,372.2
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 30th Sept., 1939, were : palm oil 1,270 tons, palm kernels 1,545 tons.

MALAYAN RUBBER STATISTICS.

ACREAGES OF TAPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 30TH SEPTEMBER, 1939.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping (d)		Acres (7)	Percent- age of (7) to (2) (8)	Acres (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acres (13)	Percent- age of (13) to (2) (14)
		Acres (3)	Percent- age of (3) to (2) (4)	Acres (5)	Percent- age of (5) to (2) (6)								
S. S.—													
Province Wellesley ...	43,041	928	2.1	12,773	29.7	507	1.2	13,701	31.8	29,340	68.2	7,731	18.0
Malacca ...	118,010	2,581	2.2	32,259	27.3	1,995	1.7	34,840	29.5	83,170	70.5	24,574	20.8
Penang ...	2,505	nil	nil	1,068	42.6	35	1.4	1,068	42.6	1,437	57.4	60	2.4
Singapore ...	32,005	4,670	14.6	8,913	27.8	275	0.9	13,583	42.4	18,422	57.6	3,965	12.4
Total S.S. ...	195,561	8,179	4.2	55,013	28.1	2,812	1.4	63,192	32.3	132,369	67.7	36,330	18.6
F. M. S.—													
Perak ...	283,620	11,116	3.9	63,877	22.5	7,071	2.5	74,993	26.4	208,627	73.6	47,550	16.8
Selangor ...	315,395	5,721	1.8	62,484	19.8	6,814	2.2	68,205	21.6	247,190	78.4	52,196	16.5
Negri Sembilan ...	261,748	11,039	4.2	64,156	24.5	11,606	4.4	75,195	28.7	186,553	71.3	39,264	15.0
Pahang ...	85,301	3,858	4.5	21,960	25.8	5,216	6.1	25,818	30.3	59,483	69.7	9,415	11.0
Total F.M.S. ...	946,064	31,734	3.3	212,477	22.5	30,707	3.2	244,211	25.8	701,853	74.2	148,425	15.7
U. M. S.—													
Johore ...	477,953	16,942	3.5	133,158	27.9	35,268	7.4	150,100	31.4	327,853	68.6	60,845	12.7
Kedah ...	208,600	8,615	4.1	26,310	12.6	6,847	3.3	34,925	16.7	173,675	83.3	42,435	20.3
Kelantan ...	31,235	403	1.3	6,842	21.9	2,612	8.4	7,245	23.2	23,990	76.8	5,432	17.4
Trengganu (d) ...	4,817	nil	nil	42	0.9	nil	nil	42	0.9	4,775	99.1	2,301	47.8
Perlis (e) ...	1,459	335	23.0	271	18.5	147	10.1	606	41.5	853	58.5	224	15.4
Brunei ...	5,918	nil	nil	1,791	30.3	313	5.3	1,791	30.3	4,127	69.7	1,456	24.6
Total U.M.S. ...	729,982	26,295	3.6	168,414	23.1	45,187	6.2	194,709	26.7	535,273	73.3	112,693	15.4
Total MALAYA ...	1,871,607	66,208	3.5	435,904	23.3	78,706	4.2	502,112	26.8	1,369,495	73.2	297,448	15.9

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th June, 1939.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF SEPTEMBER, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1939	during the month	Jan. to Sept. 1939	during the month		January to Sept. 1939		during the month		January to Sept. 1939		Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1939
								Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local					
MALAY STATES:—																				
Federated Malay States	2	3,334	23,984	11,241	69	39,307	6,930	39,205	Nil	Nil	11	12	13	14	15	16	17	18	19	21
Johore	...	1,441	8,931	4,806	39,009	4,105	25,425	Nil	80	Nil	485	2,487	5,709	10,476	10,423	29,272	...	5,916	23,368	20
Kedah	...	204	5,435	2,923	22,408	924	6,449	Nil	Nil	Nil	Nil	Nil	1,468	2,615	13,465	16,023	...	2,833	7,993	164
Perlis	...	10	33	13	90	15	169	Nil	Nil	Nil	Nil	Nil	43	Nil	274	11	...	490	4,913	...
Kelantan	...	406	774	372	2,892	604	4,865	Nil	Nil	Nil	Nil	307	828	2,398	5,426	359	...	11	17	...
Trengganu	...	15	353	144	1,207	253	1,954	Nil	Nil	Nil	Nil	Nil	429	Nil	3,165	43	...	359	662	...
Brunei	...	8	82	52	351	47	497	...	...	...	...	...	117	...	876	Nil	...	293	72	...
Total Malay States	...	5,418	39,592	19,551	155,264	12,878	78,564	Nil	80	Nil	485	14,738	15,791	140,695	97,902	...	9,652	27,318	20	164
S. SETTLEMENTS:—																				
Malacca	...	1,363	2,111	1,034	8,444	681	4,486	Nil	Nil	Nil	Nil	2,063	...	...	...	...	...	1,619	1,886	...
Province Wellesley	...	903	954	458	3,363	202	1,426	Nil	Nil	Nil	22,723	91,563	6,197	...	...	...	...	1,084	974	...
Penang	...	947	2,096	21	146	91	601	2,818	13,474	22,723	111,047	452	22,096	...	...	...	2,137	2,071	13	...
Singapore	...	4,453	13,074	250	128	947	135	475	15,440	111,047	452	...	...	...	...	...	6,960	12,314	198	...
Labuan	13	Nil	Nil	Nil	2	77	44	...	...	...	...	...	...	...	...	Nil	Nil	...
Total Straits Settlements	...	5,400	17,449	3,336	12,900	1,111	7,065	18,392	13,474	131,222	452	30,356	...	...	...	...	9,697	17,099	3,071	...
Total Malaya	...	5,400	22,867	42,928	21,189	168,164	13,989	85,629	18,302	13,554	134,222	45,094	15,791	391,641	97,902	...	9,097	26,751	40,389	37

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Fede- rated Malay States	S' pore	Penang	Prov- ince Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	5,006	11,742	1,583	2,463	2,242	283
WET RUBBER	910	572	453	246	591	207
TOTAL	5,916	12,314	2,071	2,714	2,83	490

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1939
Singapore	31,081	268,735
Penang	9,242	82,159
Port Swettenham	4,642	39,803
Malacca	129	944
MALAYA	45,094	391,641

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept. 1939
Malay States	30,436	237,998
Straits Settlements	2,564	19,757
MALAYA	33,531	257,755

- Notes:—**
- Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 - The production of estates of less than 100 acres is based on the following formula: $\text{Production} = \text{Exports} + \text{Stocks at end of month} - \text{Stocks at beginning of month} = [13] - [4] - [5] - [9] - [10]$. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 - Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40% stocks elsewhere are in dry weights as reported by the dealers themselves.
 - Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 - All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 - The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th October, 1939.

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.			
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total.	Most in a day.	Number of days.				Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.		Highest	Lowest	Min.	Lowest					Precipitation in or more	Thunderstorm	Fog morning obs.	Gale force 8 or more			
°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.	mm.	in.	mm.	hrs.	hrs.	hrs.		
Railway Hill, Kuala Lumpur, Selangor	89.2	71.6	80.4	95	82	74	83.2	84.4	7.97	202.4	1.94	13	15	6	1	123.10	4.10	34
Bukit Jeram, Selangor†	87.4	71.5	79.5	91	77	74	84.5	86.5	8.06	204.7	1.69	17	14	1	—	118.70	3.96	33
Port Swettenham, Selangor	87.9	72.7	80.3	91	82	74	83.9	85.3	5.08	129.0	0.85	13	14	1	—	131.75	4.39	36
Sitiawan, Perak	89.2	72.4	80.8	93	80	75	83.1	84.4	8.88	225.6	1.40	19	18	5	—	134.85	4.49	37
Ipoh Aerodrome, Perak	89.7	72.2	80.9	93	85	75	85.2	86.8	8.97	227.8	2.11	16	14	4	5	154.85	5.16	43
Temerloh, Pahang	88.3	71.1	79.7	92	84	74	82.2	84.6	11.97	304.0	2.68	24	19	5	29	122.25	4.07	34
Kuala Lipis, Pahang	86.8	73.6	80.2	89	72	81	85.4	87.3	8.28	210.3	2.04	21	15	3	—	182.15	6.07	50
Kuala Pahang, Pahang	84.6	75.1	79.9	87	71	80	82.0	83.2	12.25	311.2	4.70	17	16	4	—	125.10	4.17	35
Kallang Aerodrome, S'pore	85.8	74.4	80.1	83	71	79	83.9	84.7	14.21	369.9	6.78	24	19	3	—	136.90	4.56	38
Bayan Lepas Aerodrome Penang	84.2	73.1	78.7	88	70	76	83.4	85.0	12.43	315.7	2.28	20	19	5	—	141.50	4.72	39
Malacca Town, Malacca	87.5	71.3	79.4	94	69	81	81.4	82.4	8.83	224.3	2.27	20	16	6	7	108.55	3.62	30
Kluang, Johore	86.7	71.7	79.2	91	70	75	82.4	83.0	4.04	102.6	1.39	17	13	6	—	152.40	5.08	42
Mersing, Johore	86.3	73.4	79.9	91	71	75	83.9	85.3	11.94	303.3	3.16	21	17	—	—	151.90	5.06	42
Alor Star, Kedah	89.5	72.9	81.2	94	70	87	84.5	85.6	7.43	188.7	2.30	14	12	2	—	183.00	6.10	49
Kota Bharu, Kelantan	88.4	72.5	80.5	91	70	86	84.0	86.4	5.19	131.8	1.36	17	14	10	—	174.65	5.82	48
Kuala Trengganu, Trengganu	86.6	75.8	81.2	91	72	79	84.6	86.4	23.54	597.9	9.34	16	15	—	—	182.70	6.09	50
Labuan	74.0	62.0	68.0	78	58	64	71.9	72.5	6.22	158.0	0.81	21	20	—	10	112.40	3.75	31
HILL STATIONS. Fraser's Hill, Pahang 4268 ft. Cameron Highlands, Tanah Rata, Pahang 4750 ft. Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.	71.3	57.4	64.3	75	52	66	70.1	69.9	16.37	415.8	2.30	25	23	5	7	80.00	2.67	22
...	70.8	59.0	64.9	75	57	63	*	*	16.17	410.7	1.93	23	22	—	—	88.75	2.96	25

THE
Malayan Agricultural Journal.
DECEMBER, 1939

EDITORIAL.

**Padi Research
in Malaya.**

In accordance with established custom we devote the December number of the Journal exclusively to an account of the selection and varietal experiments and of the manurial and cultural experiments on padi which have been carried out by the Department of Agriculture during the season 1938-39. This account possibly possesses an enhanced interest at the present time in view of the necessity for increasing the local padi crop, since there are only three broad methods of producing this desirable result. These are, respectively, to increase the area under padi and where possible to improve or provide drainage and irrigation services, and to improve the planting material and cultural operations generally. A combination of these broad methods will of course produce the best results, and Malaya's padi policy has for some years past developed the application of this combination.

The chief aim of the experiments described in this number is, firstly, to improve the local types of planting material and secondly, to discover which cultural and manurial practices produce the best results from such material under conditions which vary in different districts. In "commercial" districts, for example, where padi is grown chiefly for sale to millers, the chief desiderata in selecting strains of padi are high average yield over the area coupled with good milling quality, for the operations of milling are greatly facilitated by uniformity in the raw product. One might instance the Krian District in Perak where Seraup 48, the strain advocated by this Department, is now extensively grown and earns a premium over other varieties at the local mills. The tendency in such districts, therefore, is to select or breed a standard high-yielding strain which can be grown successfully over wide areas.

In districts where padi is grown chiefly for home consumption, on the other hand, heavy yield and standardization frequently have to take second place to factors such as minor difficulties in connexion with water control and harvesting and individual preferences in the matter of flavour, and in such districts one is apt to find a number of different varieties in common use. Under these circumstances, therefore, Departmental policy has been to select and improve the best of the types acceptable to the local inhabitants. The first article in this number, by Mr. R. B.

Jagoe, describes the selection and varietal trials carried out on the numerous Departmental Padi Experiment and Test Stations during the season under review, and the foregoing considerations explain the large number and diversity of varieties under examination. The stage has now been reached in a few districts, however, where certain of the strains that have been under test for a number of years can be discarded, and consideration is in fact being given to the possibility of advantageously reducing the number of types under examination.

Turning now to the cultural and manurial aspects of padi cultivation, an article by Mr. R. G. H. Wilshaw describes the various experiments which have been carried out by the Department during the last two seasons. Mr. Wilshaw's conclusions from experiments conducted over the last nine years merit the closest attention. Firstly, the problem of the "bar" to increased yields—the factor or factors which operate to limit the yields of padi on most Malayan soils—is still unsolved. Every likely combination of manurial and cultural treatment likely to elucidate this problem has been tried, but without success. Mr. Wilshaw has therefore reached the conclusion that since as a general rule it is only the padi soils on the east coast of the Peninsula that exhibit definite yield response to manurial treatment there can be little value in continuing with padi manurial trials on the west coast until further research along different lines has given a clue to the nature of the "bar" factor or factors which operate on most of the west coast soils.

In conclusion, however, it may be remarked that the figure of 300 gantangs per acre, which represents the average of wet padi over the last seven years for the whole of Malaya, compares favourably with similar yield figures from surrounding countries.

Original Articles.

PADI SELECTION AND VARIETAL TRIALS 1938-1939

Compiled by
R. B. JAGOE,
Botanist.

The following is a summary of varietal trials and selection work carried out by the Field Branch of the Department of Agriculture in twelve States and Settlements in the Malay Peninsula and Borneo during the 1938-39 season.

The distribution of the Experiment and Test Stations can be seen on the accompanying map and is as follows:—

Perlis	...	2 Test Stations.
Kedah	...	Telok Chengai Experiment Station and 9 Test Stations.
Penang	...	1 Test Station.
Province Wellesley	...	2 Test Stations.
Perak	...	Titi Serong, Talang and Sungei Manik Experiment Stations and 9 Test Stations.
Selangor	...	4 Test Stations.
Negri Sembilan	...	3 Test Stations.
Malacca	...	Pulau Gadong Experiment Station and 2 Test Stations.
Pahang	...	9 Test Stations.
Johore	...	3 Test Stations.
Kelantan	...	Kota Bharu Experiment Station and 3 Test Stations.
Brunei	...	Kilanas Experiment Station and 3 Test Stations.
Labuan	...	1 Test Station.

(A total of 7 Experiment Stations and 51 Test Stations, of which 4 Test Stations have just been established, and were not used this season).

As formerly,* standard Latin Squares were generally used for varietal trials and the minimum significant difference between yields of any two strains or varieties has been estimated on a basis of Fisher's "t" test for 95 per cent. probability.

The season as a whole has been favourable for the rice crop, except in parts of Selangor, Pahang and Malacca where drought at the commencement of the season seriously handicapped the progress of cultivation and planting, and has resulted in poor yields over various portions of these three States.

* *Malayan Agricultural Journal*, Vol. XXVI, No. 12, 1938.

The primary importance of an adequate and assured supply and the control of water, including efficient drainage, is now fully realized, but can never be too greatly emphasized. Much valuable work is being done with both large and small irrigation schemes by the Drainage and Irrigation Department.

Throughout Malaya, in general, the padi season occupies the months of June to January; but June, July and August, except in Kedah and the Malacca coast, constitute a relatively dry season, and it is necessary that supplies of water in irrigation schemes should be based on the needs of the padi crop during this time.

PERLIS.

Kampong Salang Test Station.

Variety	Mean Yield per 1/120th acre in lbs.		
	Square A	Square B	Average
Siam 29 ...	24.8	24.7	24.8
Siam 76 ...	22.2	23.7	23.0
Radin China 4 ...	23.8	24.2	24.0
Mayang Ebus 80 ...	24.7	24.5	24.6
Reyong 20 ...	25.3	25.5	25.4
* S.D. = 1.2 M.S.D. = 1.1 lbs.			

The soil at Kampong Salang is a light clay, and there is fairly good water control. Reyong 20 continues to give one of the best returns of crop.

Permatang Pauh Test Station.

Variety	Mean Yield per 1/120th acre in lbs.		
	Square A	Square B	Average
Siam 29 ...	16.8	19.3	18.1
Radin China 17 ...	19.5	20.8	20.2
Mayang Ebus 80 ...	20.7	20.8	20.8
Reyong 20 ...	11.3	13.0	12.2
Radin Benua ...	15.6	17.7	16.7
By inspection, Reyong 20 inferior to other varieties. Plot yield variation was very great.			

* S.D. = Standard Deviation.

M.S.D. = Minimum Significant Difference.

PADI SELECTION EXPERIMENT MALAYA



This Test Station has been substituted for the former one at Seriab, as the soil is considered to be more typical of the heavy coastal clay.

Yields are possibly much lower in the first season than they will be subsequently. The order of yields of the different strains is very similar to those which have been obtained at Seriab.

KEDAH.

Telok Chengai Experiment Station.

This Experiment Station is situated on medium alluvial clay and is largely dependent on local rainfall for its water supply. Preliminary ploughing and repair of rice field bunds takes place as soon as sufficient water has collected in the *bendang*, about the beginning of April. The heavy rains usually commence about the end of July, which is much earlier than further south in the Peninsula.

This Station has produced some widely successful strains of Mayang Ebus, Reyong and Radin China, especially Mayang Ebus 80 and 88.

A Latin Square varietal trial was re-introduced this season, including Siam 29, with selections of the above mentioned varieties and bulked samples of two of the varieties now undergoing selection.

Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	28.9
Mayang Ebus 80 ...	31.4
Reyong 6 ...	29.4
Radin China 17 ...	27.6
Mayang Tekai ...	26.4
Serendah Sg. Dua ...	24.9
S.D. = 2.4 M.S.D. = 3.1 lbs.	

Pure Line Selection.

Selections made during the previous season (1937-38) from the varieties Mayang Tekai, Serendah Sg. Dua, and Raja Muda were again planted in ear-to-row lines. The following table shows the ratio of the number of lines which have been retained to the number of lines under observation during the previous season.

Name of Variety	No. of Lines Planted 1937-38	No. of Lines Planted 1937-38
Mayang Tekai ...	100	25
Serendah Sg. Dua ...	100	24
Raja Muda ...	50	19

Each row contained 71 plants. The following observations were recorded:

(a) Mayang Tekai: out of 25 rows all have black tips except Nos. 67, 84, 47 and 29 which have self-coloured tips; No. 33 is aberrant, all plants being much smaller than the other rows and ripening earlier.

(b) Serendah Sg. Dua: showed much better growth than during the previous season. Rows 87, 89, 97 and 37 were taller than the remainder, but this may be due to soil heterogeneity.

(c) Raja Muda: still poor but to be continued for another year. Row 46 is aberrant having a small grain like Chubai; row 4 has black tips (all other rows being without this feature). Yields from each row were recorded.

Jitra Test Station.

This Station is situated on alluvial clay, and is not entirely dependent on local rainfall as water supply is usually obtainable from a dam in a nearby canal.

There was a good deal of lodging this season.

Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	37.7
Mayang Ebus 80 ...	34.1
Radin China 4 ...	31.5
Radin China 17 ...	31.9
Anak Kuching ...	36.2
S.D. = 1.7 M.S.D. = 2.5 lbs.	

A second Latin Square trial was also laid out with Siam 29, Siam 76, Reyong 6, Reyong 20 and Mayang Ebus 88, but the last three, Reyong 20 and Reyong 6 in particular, were so severely damaged by rats that the trial was of no significance as a test of varietal yields.

Padang Prahu Test Station.

This Test Station is a new one situated north of Jitra in shallow clay soil typical of much of North Kedah and less productive than the alluvium at Jitra. Like most of the Test Stations in Kedah it is dependent on direct rainfall for water supply.

Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	20.9
Mayang Ebus 80 ...	21.7
Radin China 4 ...	20.4
" " 17 ...	21.5
Selindang Gunong ...	16.9
By inspection, S. Gunong, the unselected local variety, is significantly inferior to the selected strains.	

Sala Kanan Test Station.

This Station is also on alluvial clay and is dependent on local rainfall for water supply.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	(26.3) 31.0 Rat damage	Siam 29 ...	30.1
" 76 ...	27.6	Radin China 4 ...	29.5
Mayang Ebus 80 ...	30.4	" " 17 ...	29.7
" " 88 ...	26.5	Reyong 6 ...	29.9
Radin Pasir ...	29.2	" 20 ...	(16.2) Severe rat damage
Not analysed; severe rat damage in two plots of Siam 29. By inspection, M.E. 80 probably superior to M.E. 88.		Not analysed.	

Reyong 20 was sown and planted on the same dates as the other varieties, yet all its five plots were singled out by rats for much more severe attention than the other twenty plots.

Rantau Panjang Test Station.

The Station is situated on light alluvial clay and is dependent on local rainfall for water supply.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	22.4	Siam 29 ...	23.6
Mayang Ebus 80 ...	24.5	" 76 ...	22.7
" " 88 ...	24.7	Mayang Ebus 88 ...	26.3
Radin China 4 ...	22.8	Reyong 6 ...	22.4
Anak Didek ...	24.3	" 20 ...	(15.7) Severe rat damage
By inspection, no significant difference.		S.D. = 2.2 M.S.D. = 3.2 lbs.	

Heavy flooding from the Muda River was experienced between 24th and 30th of September, the crop being wholly submerged for 6 days.

Reyong 20 was again singled out for special attention by rats.

Langgar Test Station.

This Station is situated on light clay soil and is dependent on local rainfall.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	17.3	Siam 29 ...	18.4
Mayang Ebus 80 ...	19.4	To Seman 35 ...	18.2
" " 88 ...	14.5	" " 42 ...	18.8
Radin China 4 ...	17.3	" " 103 ...	18.0
" " 17 ...	16.0	Suban Intan ...	19.6
S.D. = 1.4 M.S.D. = 2.0 lbs.		S.D. = 1.0 M.S.D. = 1.5 lbs.	

This is the only Station which was appreciably affected by *Sclerotium oryzae* this season. The attack, however, was mild.

Pulai Test Station.

This Station is situated on sandy clay soil. Water supply is partly dependent upon local rainfall and partly upon irrigation from a stream.

Lodging was prevalent this season.

Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	32.1
Mayang Ebus 80 ...	37.4
Radin China 4 ...	35.9
" " 17 ...	36.3
Serendah Sg. Dua ...	31.9
S.D. = 1.6 M.S.D. = 2.3 lbs.	

It is noteworthy that the two Test Stations, Pulai and Jitra, within areas partly irrigated and not entirely dependent on local rainfall, have given the best returns of crops. These two Stations and Sala Kanan are usually the highest yielding Test Stations in Kedah.

Sik Test Station.

A new Test Station of just over 2 acres in the centre of Kedah, where trials will commence in the 1939-40 season. It is situated on light inland valley soil of apparently low fertility, but is usually cultivated, either by plough or by changkol. It is dependent on rainfall for water supply, and dry nurseries are customary.

Kulim Test Station.

A new Test Station of 5 acres in the south of Kedah, where trials will commence in the 1939-40 season. The soil is light and shallow, but irrigation water is obtainable in moderate amount from a nearby stream. Wet nurseries are used.

While the Test Stations in Kedah have given yields above average they are not especially high, but the total padi crop from the State of Kedah is the highest yet recorded, being about 240,000 tons of padi for 258,350 acres, or an average of nearly 2,000 lbs. padi per acre.

Langkawi Island Test Station.

Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	10.5
Nachin 10 ...	12.1
Mayang Ebus 80 ...	10.1
Reyong 20 ...	9.9
Puteh Meliyau ...	10.3

By inspection, no significant differences, but Nachin 10 again shows the highest average yield. Soil light and sandy.

PENANG.

Genting Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang Kuning 48 ...	18.6	Mayang Kuning 48 ...	18.2
Mayang SaBatil 5 ...	19.5	Seraup 15 ...	16.1
" " 6 ...	19.0	" 371 ...	16.8
" " 8 ...	20.6	" 146 ...	15.8
" " Un- selected Local ...	18.7	" 36 ...	14.2
S.D. = 1.4 No significant difference		S.D. = 1.3 M.S.D. = 1.8 lbs.	

The early part of the season was very dry, and planting was consequently rather later than usual. There was plenty of rain from August to October, but November and December were exceptionally dry, resulting in a shortened maturation period and reduced yields. There was good weather for harvest in February.

Mayang SaBatil is a popular Penang variety of padi, and strains selected at Titi Serong Experiment Station, Krian, are proving successful in Penang, in Province Wellesley South and in Krian, but the grain is difficult to thresh and it may not be so widely popular as was hoped, outside Penang, on this account.

PROVINCE WELLESLEY.
Bukit Merah Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang Ebus 80 ...	18.4	Mayang Ebus 80 ...	19.6
" " 203 ...	18.1	Siam 29 ...	18.0
" " 209 ...	16.8	Reyong 6 ...	18.8
Siam 29 ...	16.6	Coimlatore 5 ...	16.9
Reyong 6 ...	18.5	Konchor ...	16.2
S.D. = 1.3 No significant difference.		S.D. = 1.0 M.S.D. = 1.4 lbs.	

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang Ebus 80 ...	19.4	Siam 29 ...	17.6
" " 203 ...	17.8	Reyong 6 ...	17.7
Anak Didek ...	19.0	Anak Didek ...	18.3
Patok ...	19.0	Patok ...	18.3
Radin Pulaui ...	17.0	Radin Pulaui ...	16.6
S.D. = 1.2 M.S.D. = 1.7 lbs.		S.D. = 0.8 M.S.D. = 1.1 lbs.	

The soil is a medium heavy clay, which is typical of most of Province Wellesley. There is a supply of water by irrigation channel from a small river, but the Station is largely dependent on rainfall at the beginning of the season.

There was shortage of water early in the season, but adequate rain in December made a great improvement in the growth of crops.

Yields are not very high but they are considerably better than last season.

Results confirm the popularity of Mayang Ebus 80 in Central Province Wellesley, and that Reyong 6 is also a good strain for this district.

The local varieties Anak Didek and Patok are good types of padi both as regards yields and form of grain, and preliminary selection will be undertaken.

With rain in February, Siam 29 lodged in most parts of the Test Station, and Mayang Ebus 203 did not stand up as well as Mayang Ebus 80.

Recent selections at Telok Chengai, Kedah, were also introduced for observation, and similar observation lines of selected strains in the present Latin Square trials were also planted.

Yields from 600 plants were as follows:—

Variety			Yields per 600 plants	
			Gantangs	lbs.
Mayang Ebus	80 ...		8.0	46.0
" "	203 ...		7.6	44.3
" "	209 ...		5.8	33.5
Reyong	6 ...		6.5	37.3
Siam 29	29 ...		8.6	45.3
Coimbatore	2 ...		7.3	41.0
"	5 ...		8.5	46.3
"	7 ...		8.1	44.5
Mayang Tekai	6 ...		9.1	49.3
" "	8 ...		8.0	43.0
" "	14 ...		8.3	44.8
" "	41 ...		8.5	46.3
Serendah Sg. Dua	25 ...		7.8	41.0
" "	46 ...		10.0	53.5
" "	84 ...		8.1	46.5
" "	87 ...		8.8	50.3

It may be noted that the yields of Reyong 6, Siam 29 and Coimbatore 5 come in different sequence from those in the Latin Square trials.

It is clear that the final Kedah selections of Mayang Tekai and Serendah Sg. Dua will be well worth trial.

Sungei Acheh Test Station.

Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	29.1
Mayang Kuning 48 ...	27.3
Seraup 146 ...	25.0
Seraup 15 ...	24.1
Machang 42 ...	19.6
S.D. = 1.8 M.S.D. = 2.5 lbs.	

A second Latin Square with Mayang Kuning 48, and Seraups 371, 48, 36 and 146 was laid down but portions of it were very severely damaged by rats. There was, however, much less rat damage on the Station as a whole than during last season.

The soil is medium heavy coastal clay, and conditions are very similar to those of north-west Krian in Perak. The Krian Irrigation Scheme has been extended to include over 4,000 acres in Sungei Acheh in South Province Wellesley.

In the multiplication plots Mayang Kuning 48, Seraup 371 and Mayang Sa-Batil 8 all gave very good yields.

Although irrigation water was of great service and effect during the dry weather early in the season, it was, this season, insufficient for the full requirement of this area of padi land. Dry weather from late December onwards provided the best of conditions for ripening and harvest.

PERAK.**Titi Serong Experiment Station.**

Conditions were very similar to those of the 1937-38 season. Planting was again slightly late owing to shortage of water, but later conditions were satisfactory until time of harvest. Drainage was then again found to be difficult owing to seepage from the canal for the Sungei Acheh extension, which was still near full supply level; in consequence the neighbouring padi fields were two or three inches deep in water at harvest.

Attacks by rats were more evident during this season, and some damage was done by birds.

In certain areas of somewhat higher and inferior land the spike sedge, *Eleocharis ochrostachys*, Steud. (Malay—*purun ular*), was more conspicuous than usual. This sedge which is especially common in South Krian, appears to be associated with land giving poor yields.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	24.5	Mayang SaBatil 8 ...	21.0
Mayang Kuning 48 ...	23.0	Mayang Kuning 48 ...	19.3
Seraup 371 ...	18.3	Tongkat 2 ...	19.0
" 146 ...	17.2	Machang 2 ...	15.5
" 48 ...	16.7	Seraup 48 ...	13.6
By inspection, Mayang SaBatil 8 and Mayang Kuning 48 significantly superior to Seraups.		S.D. = 2.2 M.S.D. = 3.2 lbs.	

Mayang SaBatil 5 ...	21.7	Tongkat 2 ...	21.6
" " 6 ...	21.3	" 1 ...	20.8
" " 8 ...	21.1	" 7 ...	18.2
" " 9 ...	19.4	" 10 ...	19.2
Seraup 48 ...	16.0	Seraup 48 ...	16.9
By inspection, Seraup 48 significantly inferior to Mayang SaBatil selections.		S.D. = 1.6 M.S.D. = 2.3 lbs.	

Mayang SaBatil and Mayang Kuning 48 have given fairly good yields but the Seraups are no better than the previous season. Seraup 371 remains the best of these in Latin Square trials.

Pure-line Selection.

In all, 199 strains were undergoing selection, including Machang 2 (Batu Kurau), Tongkat 1, 2, 7 and 10 (Batu Kurau), Mayang SaBatil 5, 6, 8 and 9 shown in Latin Square trials.

Machang 2 has not proved successful. Tongkats have very strong straw and low tillering capacity. They also have good grain type but are not likely to be

adopted for Krian and will be tried at Batu Kurau or Bukit Gantang next season. The Mayang SaBatil strains are good in respect of yields, grain type and straw strength, and extended trials have been arranged.

Other strains are as follows:—

Machang.—Nine strains from Krian. None of the Machangs are particularly good as regards yield, but they have fairly good straw and good grain type.

Mayang SaBatil.—Sixty-five more lines have been obtained from preliminary selection in Province Wellesley. Some of these lines appear to be very promising indeed.

Seraup.—Fifty-five further lines of Seraups from Krian were included, but yields are disappointing and vary considerably compared with those of last season.

Seri Raja.—Twenty lines out of the thirty-six from preliminary selection at Sungei Kepar and Selinsing (Krian) gave very varying results.

Serendah.—Eight lines out of the thirteen from preliminary selection at Bagan Serai (Krian). None is outstanding but all will be kept.

Chantek Puteh and Chantek Merak.—Twenty-one lines from Lenggong (Upper Perak).

Planting Distance Experiment.

Owing to considerable bird damage at Kuala Kurau, one of the Test Stations concerned, this experiment cannot be fully analysed this season, and it is to be continued during the 1939-40 season.

A comparison of results at Titi Serong (fairly good soil) and Bagan Serai (medium poor soil) is, however, of interest.

Planting Distance		1 ft. x 1 ft.		1½ ft. x 1½ ft.		2 ft. x 2 ft.	
Variety		S.48	S.371	S.48	S.371	S.48	S.371
<i>Titi Serong</i>							
No. of tillers	...	8.5	9.2	15.6	16.4	22.9	23.5
Yield per tiller. lbs. x 100	...	0.56	0.52	0.69	0.60	0.78	0.73
Yield per hill lbs. x 100	...	4.78	4.80	10.69	9.91	17.76	17.15
Yield per acre lbs.	...	2080	2090	2080	1930	1940	1870
<i>Bagan Serai</i>							
No. of tillers	...	9.6	9.9	18.5	18.8	28.2	26.8
Yield per tiller. lbs. x 100	...	0.33	0.33	0.34	0.36	0.43	0.46
Yield per hill lbs. x 100	...	3.15	3.24	6.20	6.65	12.13	12.18
Yield per acre lbs.	...	1370	1410	1200	1290	1320	1330

Kuala Kurau Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	18.2	Mayang SaBatil 8 ...	19.2
Mayang Kuning 48 ...	14.6	Mayang Kuning 48 ...	16.9
Seraup 371 ...	11.9	Tongkat 2 ...	17.0
" 146 ...	11.9	Machang 2 ...	13.1
" 48 ...	11.8	Seraup 48 ...	10.6
Great variation in yields due to attacks by rats and birds. Not analysed.			

All the Malay padi planters around Kuala Kurau, on account of drought in June and July, delayed planting some weeks after it had been done at the Test Station, with the result that when the padi at the Test Station ripened it was the first in the locality and attracted concentrated attacks by birds. Rats also did more damage to the plants than usual, at an earlier stage of growth.

Tanjong Piandang Test Station.

This Test Station, which was opened this season, is situated in the heavy clay soil of old mangrove swamps north of Kuala Kurau, along the coast road.

At the commencement of the season, after the Seraup strains had been planted, there was not a great deal of water, and in this shallow water the concentration of sea water salt dissolved out of the ground was too great for the young padi plants.

The water was subsequently changed two or three times, and later, with plenty of it, the plants grew very well indeed.

The presence of salt will probably be a difficulty in connexion with padi cultivation in this extension for several seasons, especially if there should happen to be a shortage of irrigation or rain water.

Growth eventually was very good and heavy yields from Seraup strains were expected but it is the first land in this new extension to be planted with padi and, naturally, the crop suffered a very great deal from rat and bird damage.

Bagan Serai Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	19.0	Mayang SaBatil 8 ...	18.1
Mayang Kuning 48 ...	20.4	Mayang Kuning 48 ...	19.2
Seraup 371 ...	16.2	Tongkat 2 ...	16.5
" 146 ...	16.1	Machang 2 ...	18.0
" 48 ...	15.4	Seraup 48 ...	15.3
S.D. = 1.5 M.S.D. = 2.2 lbs.		S.D. = 1.7 M.S.D. = 2.5 lbs.	

Radin 4 ...	19.5	By inspection no significant differences.
" 11 ...	19.4	
" 13 ...	19.6	
Seraup 371 ...	20.9	
" 48 ...	19.3	

Although there was an insufficiency of water during November and December, water control throughout the season was, on the whole, good and yields are better than they have been for several seasons. Mayang Kuning 48 has done fairly well, as last year, but it has a longish type of grain, not very suitable for mixing with the usual Seraup type for milling purposes.

Briah Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	17.7	Mayang SaBatil 8 ...	16.6
Mayang Kuning 48 ...	19.9	Mayang Kuning 48 ...	16.0
Seraup 371 ...	14.1	Tongkat 2 ...	13.7
" 146 ...	14.5	Machang 2 ...	15.2
" 48 ...	13.1	Seraup 48 ...	12.7
S.D. = 2.1 M.S.D. = 3.0 lbs.		S.D. = 1.1 M.S.D. = 1.6 lbs.	

Variety	Mean Yield per 1/120th acre in lbs.	
Radin 4 ...	15.9	S.D. = 0.8 M.S.D. = 1.2 lbs.
" 11 ...	13.9	
" 13 ...	13.5	
Seraup 371 ...	17.8	
" 48 ...	16.6	

Except for a dry spell during the nursery period July-August, water supply and weather conditions were good and Seraup strains have yielded somewhat better than the Radin strains in contrast to the previous two seasons. Stem-borers and rat damage were less conspicuous than last season.

Mayang SaBatil 8 and Mayang Kuning 48, also long term varieties, have done fairly well and better than the Seraups.

Sungei Kepar Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	16.2	Mayang SaBatil 8 ...	14.9
Mayang Kuning 48 ...	12.8	Mayang Kuning 48 ...	12.7
Seraup 371 ...	10.6	Tongkat 2 ...	10.5
" 146 ...	10.6	Machang 2 ...	8.4
" 48 ...	10.3	Seraup 48 ...	9.1
By inspection, Mayang SaBatil significantly superior to other strains.		S.D. = 2.2 M.S.D. = 3.2 lbs.	

Radin 4 ...	15.3	S.D. = 1.4 M.S.D. = 2.0 lbs.
" 11 ...	12.3	
" 13 ...	10.3	
Seraup 371 ...	11.4	
" 48 ...	10.4	

Nurseries failed entirely owing to drought and water shortage in July-August. Seedlings from Bria and Bagan Serai were supplied, and planting was effected somewhat earlier than in the surrounding padi fields. The Test Station is somewhat low-lying, and the padi being earlier than in the neighbourhood suffered from too much water at harvest which caused serious lodging of plants in all three Latin Squares.

Mayang SaBatil 8 and Radin 4 stood up best to the adverse conditions.

Selinsing Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	14.8	Mayang SaBatil 8 ...	14.2
Mayang Kuning 48 ...	14.3	Mayang Kuning 48 ...	13.9
Seraup 371 ...	10.3	Tongkat 2 ...	10.5
" 146 ...	10.7	Machang 2 ...	12.2
" 48 ...	11.6	Seraup 48 ...	10.2
S.D. = 1.4 M.S.D. = 2.0 lbs.		S.D. = 0.8 M.S.D. = 1.2 lbs.	

Radin 4 ...	10.9	By inspection, no significant difference.
" 11 ...	11.7	
" 13 ...	11.0	
Seraup 371 ...	10.1	
" 48 ...	10.2	

There was insufficient water during the nursery period (July-August), and the subsequent crop was below average even for Selinsing. There was water in the fields for the late February-March harvesting.

As in most of the Test Stations in Krian, Mayang SaBatil 8 and Mayang Kuning 48 gave slightly better yields than other varieties. Mayang SaBatil has a grain of very good milling type, but Mayang Kuning grain is not so good. Present Mayang SaBatil selections are now believed to be somewhat difficult to thresh, and may be unpopular on this account.

Bukit Gantang Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Sakepol 15 ...	23.2	Siam 29 ...	32.1
Seraup 48 ...	18.3	„ 76 ...	28.4
„ 146 ...	22.0	Radin 11 ...	29.4
Mayang Kuning 48 ...	21.2	„ 13 ...	25.8
S.D. = 3.0 M.S.D. = 5.2 lbs.		S.D. = 1.9 M.S.D. = 3.3 lbs.	

Machang 2 ...	27.5	Tongkat 2 ...	24.3
„ 5 ...	28.7	„ 10 ...	25.4
„ 10 ...	26.5	„ 7 ...	19.8
Seraup 48 ...	25.1	Seraup 48 ...	19.4
S.D. = 2.2 M.S.D. = 3.8 lbs.		S.D. = 2.6 M.S.D. = 4.6 lbs.	

Seraup 371 ...	23.1	S.D. = 1.3 M.S.D. = 2.3 lbs.
„ 146 ...	21.7	
„ 48 ...	19.8	
Radin Che Mah ...	17.2	

Long maturation varieties were sown on 27th July and 3rd August and the Radins and Siams on 26th August and 5th September respectively.

Dry weather at early nursery time was a difficulty but conditions during the season were normal. Rain in February interfered somewhat with regular ripening and harvest; total yield, however, was good, averaging 2,300 lbs. per acre.

Since 1933-34 season Seraup and other long term varieties have been given trials at Bukit Gantang, in addition to Radins, Siams and other medium or short term varieties, and the long term varieties have always been much or slightly better.

This season, however, the Radins and Siams did not suffer, as did the long term varieties, from a dry nursery period, and have given better crops of grain. They ripened a few days after the Seraups and may have been freer from pest damage, but they lodged badly. Lodging was very serious in Radin Che Mah, was bad in Siam plots, and fairly bad in plots of Radin 11 and 13 and Tongkat 2 and 7.

Bruas Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Seraup 146 ...	14.7	Siam 29 ...	19.1
Seraup (Bruas) ...	17.3	Pahit (Bota) ...	17.3
Pahit (Bruas) ...	17.5	Seri B. Puteh ...	13.4
Chantek ...	16.9	Radin Deli ...	15.9
Sakepol ...	18.2	Medan Petani ...	11.5
S.D. = 3.0 M.S.D. = 4.4 lbs.		S.D. = 3.0 M.S.D. = 4.4 lbs.	

Seraup 36 ...	20.0	S.D. = 2.7 M.S.D. = 4.7 lbs.
„ 146 ...	19.4	
„ 371 ...	11.2	
Siam 29 ...	24.6	

Yields are very similar to those of the previous season.

By a comparison of the yields of the standard strains in the two Latin Squares of unselected varieties with their yields in the Seraup-Siam square, it would appear that there is a marked difference of soil fertility in favour of the latter.

It would seem that the local varieties Sakepol, Pahit, Seraup and Chantek may be good, and selected strains of these might be most successful around Bruas.

Talang Experiment Station.

There was frequent failure of the irrigation dam, and in consequence lack of water during the season. Crops were slightly below average.

Mayang Ebus selections (Krian new series) have again given good yields. There are six lines of these, Nos. 10, 11, 13, 23, 30 and 32, two of which have not been tried in Latin Squares. Mayang Ebus 10, the poorest this season in the Latin Squares, was the only one which did well in the pure lines.

Talang Experiment Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang Kuning 48 ...	23.7	Mayang Kuning 48 ...	25.9
Seraup 371 ...	21.4	Seraup 371 ...	20.8
" 146 ...	20.3	Radin 11 ...	18.8
" 48 ...	23.4	Siam 29 ...	19.7
By inspection, no significant differences.		S.D. = 2.1 M.S.D. = 3.7 lbs.	

Mayang Ebus 88 ...	22.7	Reyong 20 ...	21.4
" " 202 ...	22.0	Siam 29 ...	19.9
" " 203 ...	24.3	Radin 1 ...	24.7
" " 210 ...	18.8	" 13 ...	15.3
S.D. = 1.4 M.S.D. = 2.4 lbs.		S.D. = 3.4 M.S.D. = 5.9 lbs.	

Mayang Ebus 10 ...	29.1	Mayang Ebus 10 ...	25.1
" " 11 ...	33.6	" " 11 ...	25.5
" " 13 ...	30.6	" " 30 ...	26.8
" " 203 ...	31.2	" " 203 ...	25.6
S.D. = 1.3 M.S.D. = 2.3 lbs.		By inspection, no significant difference.	

Hybrid 1/3 ...	18.5	S.D. = 1.7 M.S.D. = 2.5 lbs.
" 1/9 ...	19.6	
" 1/11 ...	16.9	
" 1/14 ...	18.1	
Siam 29 ...	19.2	

Of the hybrid selections H 1/9 is again slightly the better. All four selections have the robust, erect, low-tillering straw of Radin 2, the female parent, while H 1/9 appears to be at least as good as the male parent, Siam 29, as regards yield of grain. Field trials so far have not been very successful but are being continued both at Talang and Bruas Stations.

Pure Line Selection.

Observations were continued on 31 lines of the local variety Radin Che Mah, and on 14 lines of Chantek Puteh and 7 lines of Chantek Merah from Lenggong.

Radin Che Mah, a six months variety, again did well. Tillering was good and there was no lodging. Chantek Puteh and Chantek Merah both showed a tendency to lodge, but Chantek Merah was worse in this respect. They ripened about a month later than Radin Che Mah.

Sungei Manik Experiment Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang SaBatil 8 ...	24.0	Siam 29 ...	18.6
Mayang Kuning 48 ...	21.9	Radin 11 ...	13.8
Seraup 371 ...	21.9	" 13 ...	17.4
" 146 ...	20.0	Seraup 371 ...	19.3
" 48 ...	21.1	" 48 ...	18.8
S.D. = 2.3 M.S.D. = 3.4 lbs. but Z test did not show significance.		S.D. = 3.4 M.S.D. = 5.0 lbs. but Z test did not show significance. Most of this square lodged during ripening in January.	

Variety	Mean Yield per 1/120th acre in lbs.
Radin 4 ...	22.4
" 11 ...	18.6
" 13 ...	20.7
Mayang Ebus 88 ...	21.2
" " 203 ...	17.8
S.D. = 1.1 M.S.D. = 1.6 lbs. Mayang Ebus strains lodged in January.	

The development of the bunding, irrigation and drainage scheme for this new padi-growing land in Lower Perak made excellent progress since the previous season. Stages I and II consist of 8,119 acres of padi land of which 7,955 acres are alienated, and 5,976 acres planted during the season under review. The average yield for Stage I (5,000 acres) was 300 gantangs (1,650 lbs.) padi per acre.

The Experiment Station did not suffer from rat damage as in the 1937-38 season, but variations in levels of the different divisions caused difficulties with the regulation of the water supply. Growth, however, was good but high wind on 21st December caused some lodging, especially of Siam 29 and Seraups 48 and 146. Average yields were: 1937-38 season 217 gantangs padi per acre, 1938-39 season 345 gantangs per acre.

Lampam Test Station.

This Test Station is being established in Stage III of the Sungei Manik padi-growing area and about 3 miles from Sungei Manik Experiment Station, but is not yet in operation.

SELANGOR.

Kajang Test Station.

This Test Station has been abandoned, owing to deterioration of the padi land and the impossibility of obtaining satisfactory yields.

Kuang Test Station.

Yields of padi at this Test Station have been good, poor, or very poor, varying with seasons and the portion of the Station on which the padi was planted.

In the 1938-39 season sowing took place early in June instead of May, and whether for this reason or not, yields have been particularly poor. Siam 29, which is popular locally, was the only variety to give even small yields of grain.

In this particular padi-growing area the soil varies rather irregularly from very sandy to a stiff white clay; iron oxide is conspicuous in the clay soil, along root traces, and on the surface of the water. On the Station the stiff white clay is chiefly in the north-west section and it is here that the poorest yields occur, although they are not entirely confined to the clay soil.

Tanjong Karang Test Station.

This Test Station is situated in the north-west of Selangor on a strip of land which lies between the coast and a large area of jungle.

The soil is very good coastal clay and in favourable seasons can produce excellent crops of grain.

In common with much of the west coast, this area has a comparatively low average rainfall, and though in 1935-36 relatively very satisfactory crops were harvested on the Test Station, for the last three seasons padi cultivation has been a failure due to lack of rainfall and to rat damage.

There are, in this coastal strip north of the Sungei Tengi, about 30,000 acres of potential padi land, but owing to the low average rainfall of the coast there is always liability to shortage of fresh water, and until the scheme for providing an assured supply of irrigation water is completed the land cannot be relied upon to give good crops of padi.

For some years a small area has been intermittently cultivated with padi but the fewer the number of people who continue to attempt to plant, the worse is the rat damage. This season no cultivation was carried out in the neighbourhood of the Test Station because of lack of rainfall, and any hopes of getting any crop at the Test Station were negated by the incursion of large numbers of rats from the fallow land all round.

In the Sempadan mukim adjoining Tanjong Karang a fairly good crop was obtained over a small area by the *tugal** method of planting and this seems a possible temporary method until such time as irrigation water can be provided.

Sungei Haji Durani Test Station.

Variety		Mean Yield per 1/120th acre in lbs.	Variety		Mean Yield per 1/120th acre in lbs.
Siam 29	...	19.2	Siam 29	...	27.0
Radin 11	...	20.0	Mayang Ebus 203	...	19.8
" 13	...	14.9	" " 209	...	24.2
Reyong 6	...	18.7	Radin China 4	...	22.8
" 20	...	15.0	" " 17	...	22.4
S.D. = 2.7 M.S.D. = 3.9 lbs.			S.D. = 2.8 M.S.D. = 4.1 lbs.		

This Test Station is also situated on the north of the Selangor coast, but because it is somewhat low-lying it was liable to damage by excess of water, and a water gate was installed which has removed this danger of flooding. There is still notable variation in soil fertility.

It has been decided, however, that one Test Station is sufficient for the Panchang Bedena padi-growing area, and as a better and more convenient site has been chosen at Parit 4, the Sungei Haji Durani Test Station has now been given up, as well as the old Panchang Bedena Test Station at Parit 8.

Seed was sown this past season at the end of August, but seedlings were 100 days in the nursery beds owing to lack of rain and were not planted out till early December. Yields would probably have been even better if seedlings had not been

* *tugal* = a pointed stick (for making holes into which a few padi seeds or seedlings are planted.)

weakened by this prolonged stay in the nursery beds. They should, however, be comparable with those to be obtained at the new site, and it is of interest to note that Siam 29, Mayang Ebus 209 and Radin 11 have done well.

Panchang Bedena Test Station (Parit 8).

This Test Station has been given up. It was on slightly higher land and adjoining uncultivated land. It was subject, therefore, to serious water shortage and to rat damage.

Panchang Bedena Test Station (Parit 4).

This new Test Station at Panchang Bedena is conveniently situated within an area of 15,500* acres of padi land in the north-west of Selangor, of which 12,400 acres have already been alienated for padi cultivation. About 11,500 acres were planted in 1936 but lack of water and successive comparative failures have caused a reduction in area planted to about 8,000 acres in 1939. The average yield for the 1938-39 season was approximately 240 gantangs (1,300 lbs.) per acre.

The Panchang Bedena area lies immediately north of the Tanjong Karang area of 30,000 acres yet to be developed. It is potentially high-yielding and for improvement waits upon the completion of the same scheme for supply of irrigation water from the Sungei Tengi.

Work at this Test Station will therefore be of considerable interest and importance, as results obtained will apply generally to a total area of between 40,000 and 50,000 acres of potentially high-yielding padi land.

This first season observation lines of a good local variety and 11 selected strains were planted. The local variety, Mayang Susun, gave excellent yields, while Siam, Mayang Ebus, Radin China and Rejong strains varied from very good to fairly good.

NEGRI SEMBILAN.

Ulu Klawang Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	20.5	Siam 29 ...	26.4
Rejong 6 ...	18.4	Radin 13 ...	26.4
" 20 ...	16.9	Mayang Ebus 209 ...	25.1
Serendah Kuning ...	20.7	Milek Kuning 3 ...	30.0
S.D. = 1.4 M.S.D. = 2.4 lbs.		S.D. = 2.5 M.S.D. = 4.3 lbs.	

* Potential padi land in Sungei Panchang and Panchang Bedena mukims previously estimated at 17,000 acres.

The soil is a medium heavy clay and water supply is obtained by irrigation from the Sungei Klawang.

The dates of sowing for this season were again made later in continuance of the policy prompted by results of trials in 1936-37 and 1937-38 seasons.

Sowings took place from 16th May to 9th June compared with 1st April in the 1936-37 season. Although the yields from the first Latin Square are somewhat disappointing, those in the second Square are the best yet obtained.

The total yield from the whole Test Station of $5\frac{1}{2}$ acres was 1,700 lbs. per acre, which is appreciably higher than formerly, indicating that the adoption of the later sowing and planting dates may have been advantageous. Still slightly later sowing dates may be even better.

The success of the sowing date trials at the Test Station is reflected in the cautious adoption of later sowing dates for the Jelebu District, in which the Test Station is situated.

The difficulties of water control and the dangers of rat and bird attacks make it essential that all contiguous padi land is sown and planted more or less uniformly to give uniform harvest. The sowing and planting dates on all Padi Test Stations are, therefore, governed to a very large extent by those on surrounding land.

Ampang Tinggi Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Radin 2 ...	29.9	Siam 29 ...	26.9
" 11 ...	26.4	Nachin 11 ...	28.7
" 13 ...	19.5	Milek Kuning 3 ...	23.9
Serendah Kuning ...	23.5	R. Bersanding ...	27.0
S.D. = 1.5 M.S.D. = 2.6 lbs.		S.D. = 1.3 M.S.D. = 2.3 lbs.	

Reyong 20 ...	25.6	Radin Siak 7 ...	22.3
Mayang Ebus 203 ...	22.1	" " 17 ...	23.7
Milek Puteh 9 ...	29.1	" " 18 ...	23.8
Serendah 875 ...	14.4	" " 34 ...	24.8
S.D. = 1.8 M.S.D. = 3.1 lbs.		S.D. = 1.0 M.S.D. = 1.7 lbs.	

This Test Station is situated in a padi growing area which lies between the Muar and Seri Menanti Rivers, and is liable to frequent flooding. This season, however, only minor flooding occurred, on 7th February.

The Station was first used in 1935, and in the 1935-36 and 1936-37 seasons sowing dates of many of the varieties were found to be ill-adjusted. In the 1937-38 season all varieties were sown much too late, in August and September.

This past season sowing dates were adjusted in July and August. Yields, generally, were very satisfactory, but the effect of the adjustment cannot be estimated, as the season was fortunate with very favourable weather, and was the first in which serious flooding did not cause damage to the padi plants.

Kendong Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Milek Kuning 3 ...	19.0	Siam 29 ...	18.2
Sakepol 15 ...	16.6	Nachin 66 ...	13.6
Seraup 36 ...	14.9	Radin 13 ...	15.0
" 48 ...	15.6	Serendah 11 ...	16.9
Serendah Kuning ...	11.1	Serendah Kuning ...	13.8
S.D. = 2.2 M.S.D. = 3.2 lbs.		S.D. = 2.3 M.S.D. = 3.4 lbs.	

Reyong 6 ...	17.9	By inspection, no significant differences.
" 20 ...	16.2	
Radin Siak 34 ...	17.8	
Serendah Kuning ...	17.6	

The Kendong Test Station was first opened in the 1932-33 season, and the date of sowing used in that season for all varieties was 31st May, 1932, with considerable success for long and medium term varieties. In the 1933-34 season the sowing date adopted for long and medium term varieties was 20th March, 1933, and yields were much lower.

Sowing dates subsequently adopted were in April-May for long term varieties and in May-June for medium term varieties, but have been slightly irregular with a tendency to be too early. Yields, particularly in 1935-36, have been poor. The soil is a variable sandy clay.

This season, with good weather, except at harvest, and slightly later and better adjusted sowing dates (long term 2nd May, medium term 8th June, short term 8th July, 1938), yields, though still not very high, have been much better than any since those of the long and medium term varieties in the first season, which they approximately equal.

Various results give reasons for believing that it would be an advantage if the sowing dates were, in general, brought slightly later still, particularly those of Siam 29 and Milek Kuning 3.

PAHANG.

There are two chief distinctions in the padi growing lands of Pahang, namely the irrigated, terraced land best known as *sawah*, and the *paya-paya* or swamps along the Pahang River which have no assured water supply.

In parts of Pahang, *paya* is used indiscriminately for any land cultivated with wet padi, but the term *sawah* is readily understood. It is thought to be wise, and is convenient in this article, to make a clear distinction between two very different conditions.

Sawah.—The *sawah* lands are mainly in the Raub and Lipis Districts. Apart from the rather unpredictable weather of Pahang, these have no particular problems as in most cases they are served by irrigation channels or by streams with sufficient catchment areas to provide continued supplies of water during the season. Drainage is also easily obtained. The soil is tilled most usually by *changkol*, an implement like a heavy English hoe.

Paya.—Padi-growing in the riverine *paya* lands of Pahang, on the other hand, presents special difficulties. The *paya-paya*, with few exceptions, have no sufficient hinterland of hills to maintain a regular supply of water during the padi season, and unusual methods have been adopted for the more or less successful cultivation of padi.

The swamps are formed between low hills and the raised banks of the meandering Pahang River, and in places they extend for several miles from the river. They are numerous and vary in extent from a few to several hundred acres. Where necessary, earthworks have been built to complete the enclosure of the low-lying land, and drainage channels and various forms of water-gates have been made in all the *paya-paya*.

Fairly soon after harvest all water-gates are closed to accumulate water in these swamps from the rains of March and April. From about the end of March ground on nearby higher land is cleared for sowing nurseries, and sowing is normally carried out during April, but varies according to the weather, the variety of padi, and the position along the river.

During June and July the level of the water in the *paya* is lowered by stages. The land is cleaned by pulling or cutting weed growth, and sometimes cultivation is done by trampling with buffaloes. Planting is then done with the expectation of, or on the arrival of, further rains.

Apart from the higher level of land at the edges and from top to end, there is often great irregularity throughout the *paya*. These differences in levels are undoubtedly an important feature of padi cultivation in *paya* conditions, normally ensuring that some reasonable crop will be obtained, even with very dry weather or minor floods.

The primary difficulty is the absence of assured or sustained supplies of water, but provision of irrigation water for so many small areas would entail such expenditure in construction of storage reservoirs as would be prohibitive. Experiments in *paya* management are, therefore, very desirable with a view to overcoming, as far as possible, this difficulty, by effecting improvements in control and/or conservation of water.

Dong Test Station.

This Station has good soil, with plots slightly terraced, and a good supply of irrigation water, and is representative of considerable areas of such *sawah* or irrigated padi land in the Raub District of Pahang.

An optimum-date-of-sowing preliminary experiment was carried out here with 6 varieties, Siam 29, Nachin 11, Mayang Ebus 88, Milek Kuning 3, Radin China 4 and Radin Siak 24, with six dates of sowing between 5th June and 20th August, 1938.

Varieties were randomized within blocks and sown according to arranged dates in succession "down-hill" for convenience of water supply, as a complicated system of water control was to be avoided in the preliminary trial.

A full analysis cannot be made, because of several unanalysable factors, but the general tendency was for padi sown on 5th June to be better than later sown padi.

A properly designed experiment is being laid down for the 1939-40 season with the same six dates of sowing but with only 3 varieties, Siam 29, Milek Kuning 3 and Radin China 4.

Kuala Lipis Test Station.

This is a small Test Station some 20 miles north of Dong in a convenient but isolated small block of terraced *sawah*. Water supply is fortuitous and it is not always possible to plant as early as desired. The site also is liable to flooding from the Lipis River.

An optimum-date-of-sowing trial was laid down with 4 varieties of padi, Siam 29, Reyong 20, Milek Kuning 3, and Milek Puteh 148, and with three dates of sowing, 20th July, 4th August and 20th August.

The plants were, however, transplanted into plots arranged "down-hill" according to date of sowing, and the lowest plot, in particular, suffered severely from flooding which affected both maturation periods and yields. The results cannot be regarded as of any significance.

The experiment designed for 1939-40 season at Dong is to be replicated at Kuala Lipis.

Pulau Tawar Test Station.

This Test Station was recently established in the new inundation scheme area of Padang Kangsar a few miles below Jerantut.

It is a fairly extensive area of land within a large bend in the Pahang River, which, prior to the floods of December, 1926, included much deep swamp with *tenggala** padi round the edges. Most of the deep swamp was filled up by sand and silt and it seemed suitable for padi cultivation.

Efforts have been made to inundate the area, but it has been found it is impossible to retain the water for any length of time, and it is probable that it is able to escape through channels filled with porous sandy deposits.

The Test Station was established on the inner lateritic periphery of the padi-growing area, which even with good water supply would require several years of padi-planting before satisfactory growth could be obtained.

In contrast to this, the main area of the original swamp contains such a rich deposit of silt that in places the padi plants grow to heights of 7 ft. with luxuriant foliage, but without an equivalent yield of grain.

In the two previous seasons when the Test Station was sited above the 97.5 ft. contour no crop at all was obtained, but in this season just concluded, although conditions could hardly have been worse, some crop at least, though very meagre, was obtained, and the 97 ft. contour will continue as the approved level for inundation.

Efforts will be made in the 1939-40 season to increase the water-holding capacity of the soil by a method of puddling by means of ploughing and rolling.

Kerdau Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	2.6	Siam 29 ...	5.4
Milek Kuning 3 ...	9.1	Reyong 6 ...	4.3
Nachin 66 ...	7.3	„ 20 ...	8.0
Radin China 4 ...	5.2	Radin 13 ...	8.0
Seri Ayer ...	7.4	Seri Ayer ...	11.3

The Test Station is situated a few miles west of the Pahang River north of Temerloh, and is typical of the riverine *paya* padi lands with their lack of water-catchment hinterland and liability to frequency of floods from the Pahang River.

* *tenggala* = a plough.

Plot yields varied in range between nil and 20.4 lbs. and average yields are hardly worth recording except as a comparison with those of the previous two seasons. Sowing took place between 1st April and 16th June and the relative sowing dates of Siam 29, Radin China 4, and Reyong 6 and 20 were very faulty.

The abnormally dry October at a critical stage of growth seriously affected the crop, except in the lowest-lying portions of the *paya*. This is a reversal of the conditions of the 1937-38 season, when the lower-lying sections were overwhelmed by floods at the same time of year.

Mengkarak Test Station.

Another riverine *paya* Test Station, south of Temerloh, and closer to the river than Kerdau. It is somewhat lower-lying and not so liable to dry out, but is more subject to severe flooding.

Siam 29, Milek Kuning 3, Reyong 20, Radin China 4, Mayang Ebus 88, Radin 13, Nachin 66 and Radin Siak 34 were planted in $\frac{1}{2}$ acre blocks for observation.

Milek Kuning 3 gave the best crop, followed by Reyong 20, Siam 29 and Nachin 66, but incomparable sowing dates make comparisons between varietal results very uncertain.

Sowing took place between 9th April and 24th June. Transplanting was held up by flooding in June. The land did not dry out completely during the October drought, but in January most of the padi was submerged for 3 days during the ripening stage by a high level of flood water.

Chenor Test Station.

This is a new riverine *paya* Test Station of 6 or 7 acres on a site recently acquired at Chenor along the Pahang River half way between Mengkarak and Lubok Paku. Experiments will commence in the 1939-40 season.

Bawang Test Station.

This Test Station is an independent block of about 3 acres of level *sawah* below Bawang village, near Lubok Paku, which is on the north bank of the Pahang River half-way between Temerloh and the coast. Water supply, from the Sungei Tekok, and drainage are good, but there is liability to excessive water when the Sungei Tekok is in flood, which is not infrequent.

The Station is surrounded by scrub and jungle and is liable to pest damage. It has been in operation since 1935-36 and has given very variable returns, partly due to confusion over relative lengths of maturation periods in local conditions.

Mayang Ebus 80, sown 23rd May, and harvested 7th January, was the only strain to give over 300 gantangs (1,620 lbs.) per acre this season.

A preliminary optimum-date-of-sowing experiment will be tried here in the 1939-40 season, with 4 varieties, Milek Kuning 3, Mayang Ebus 80, Siam 29 and Seri Bumi.

Pahang Tua Test Station.

This Test Station, which is situated on old *tenggala* padi land near the mouth of the Pahang River, is being provided with irrigation water, pumped up from the Sungei Pahang Tua, to supply an area of over 8,000 acres. (Previously estimated at over 2,000 acres).

The soil is good, but the land is somewhat high-lying and therefore without a natural supply of water for irrigation or inundation.

Work on the irrigation scheme is in progress and it will be possible to commence supply of irrigation water for the 1939-40 season for a portion of this area including the Test Station.

This 1938-39 season, weed growth was cut and the land was ploughed and harrowed twice and a few observation plots were planted.

Seed was sown at the end of August and in the middle of September, but transplanting was made difficult or was delayed by the unprecedented drought in October.

At the end of that month seedlings in the nursery beds were very faded and would not have survived much longer. They were planted out with little hope of success and were put into dibble holes. Heavy dews, however, kept the holes supplied with water enabling the weak seedlings actually to recommence development of sturdy young roots, and when rain fell during the first week of November and in December the plants made rapid recovery.

Yields of over 300 gantangs were obtained from Milek Kuning 3, Siam 29 and Reyong 20, and very satisfactory crops may, therefore, be expected when the pumping scheme is in operation.

A preliminary optimum-date-of-sowing experiment, similar to that at Bawang, is to be given trial in the 1939-40 season, with six dates of sowing between 4th July and 20th September, and using 4 strains of padi, Milek Kuning 3, Siam 29, Reyong 20, and local unselected Milek Kuning.

Sungei Blat (Paya Besar) Test Station.

This Station is situated near the coast north of Pahang Tua in an area of 3,000 acres of old jungle swamp which was filled up during the floods of December, 1926.

There is a 4 to 6 ins. layer of organic material between the original heavy clay and the upper 6 to 7 ins. layer of silt, and although a sound irrigation and drainage scheme is now working satisfactorily, yields are still poor, due presumably to this "peaty" layer.

Cultivation experiments have given rise to some hope that deep cultivation may, in time, bring about improvement, and these experiments are to be continued.

There is still a lot of timber lying about in the *sawah*, and numerous undecayed tree stumps. The top soil, too, is still raw, and sedges and bog grasses are very abundant.

When most of the stumps and timber have decayed or been broken up, buffaloes will probably be used to a much greater extent, and will give the land necessary trampling cultivation.

Minor flooding occurred during December and January.

The same preliminary optimum-date-of-sowing experiment as at Bawang is to be tried here also, with Siam 29, Milek Kuning 3, and a local variety called padi Chendar.

MALACCA.
Pulau Gadong Experiment Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	29.3	Siam 29 ...	17.1
Serendah Puteh 1 ...	22.1	Serendah Kuning 1 ...	14.9
" " 3 ...	22.3	" " 3 ...	15.4
" " 6 ...	21.5	" " 4 ...	14.8
		" " 5 ...	15.5
By inspection, Siam 29 significantly superior.		By inspection, no significant differences.	

The rainfall during this season, July to February, was well below average, and dry periods interfered with cultivation and planting. The second Latin Square was on drier ground, hence the lower standard of yields.

The soil is a medium stiff clay, and the land is included in the area served by the Tanjong Minyak Irrigation Scheme. The supply of irrigation water is not quite adequate, however, and the old pump is at present unable to keep water on the higher portion of the Station. It has not yet been possible to instal a new and larger pump.

Pure-line Selection.

Ten lines of local Siam type padi were grown for the third year for observation on strength of straw. Only one line shows real promise but four were selected for further trials.

Eleven Pahang varieties were undergoing selection. Eight of these were in their second year of observation, of which 3 Milek Merah lines were the best. The 3 third-year varieties, Seri Ayer, Milek Puteh and Terong Papan all did fairly well, and various selections have been added to pure strain lines for continued observation next season.

Former selections of Serendah Puteh and Serendah Kuning were tested in Latin Square trials but yields were below those of Siam 29.

Serendah 27, 122, 144 and 149 did well in field trials.

Siam 29, Nachin 11 and Milek Puteh 9 are the highest yielding and most popular strains. Demands for seed padi exceeded available supplies.

Siam 29 is still the most popular padi but Malay farmers say that although it is the most palatable, it is not as satisfying or filling as Nachin 11.

Alor Gajah Test Station.

Weather was very dry until the end of August, when seed was sown. Transplanting at the Test Station was left till seedlings were the normal 44 days in the nursery, and they were not sufficiently well established to withstand the amount of water brought on with the onset of the rains.

The plants were weak and earing was late, and what little grain was set was attacked by *pianggang* (*Leptocoriza* sp.). The crop was not worth harvesting, except for one plot of Siam 29.

Native owners in the neighbourhood better anticipated weather probabilities, and transplanted at 25 days. The young plants were well grown by the time the heavy rains came, and good crops were expected. Unfortunately few people reaped a satisfactory crop on account of damage by *pianggang*.

Jasin Test Station.

The season was a good one on the whole although weather conditions were difficult in the early stages. Growth of all varieties was good and even, and no pest damage occurred until after flowering when the young grain was severely attacked by *pianggang*, which was responsible for a considerable reduction in crop compared with the previous season.

The varieties grown were Siam 29, Milek Puteh 9, Serendah 141 and 149, and Radin Siak 34. Radin Siak 34 was very good, giving almost 2,800 lbs. per acre, but Siam 29 yields were poor as it suffered most from *pianggang* and by lodging.

The Sungei Kesang Irrigation Scheme is now completed and will be in operation during the 1939-40 season. This Scheme will supply water to an area of 600 acres including the Jasin Test Station.

Malacca Coastal Region.

Normally, along the Malacca coast, a fairly high total of rainfall occurs during June, July and August, but occasionally, as in 1938, this period is particularly dry in that region and the unexpected shortage of water is liable to have a serious effect on the season's cultivation of padi.

Padi lands in Malacca are not served by any river which has its origin in a substantial jungle catchment area, and the flow of water in all the small streams, especially along the coast, is immediately affected by local rainfall.

JOHORE.
Jementah Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	21.8	Milek Kuning 3 ...	13.3
" 76 ...	15.3	Radin China 4 ...	10.3
Reyong 6 ...	16.1	" " 17 ...	10.3
" 20 ...	18.3	Mayang Ebus 88 ...	12.9
Mayang Ebus 203 ...	11.6	" " 203 ...	10.9
S.D. = 5.5 M.S.D. = 8.0 lbs.		By inspection, no significant differences.	

Radin 13 ...	10.9	Reyong 6 ...	11.8
Serendah Kuning ...	15.3	" 20 ...	11.8
" Puteh ...	10.7	Radin 2 ...	5.4
Nachin Puteh ...	15.0	Daron ...	7.9
Lembot Tembiling ...	9.3	Lembot Tembiling ...	4.3
Great variation in yields of sub-plots. Results not analysed.			

At the time of sowing in May, and transplanting in June-July, dry weather was experienced, but with the help of the irrigation system at the Test Station, it did not affect these operations. Heavy rain fell towards the end of October and flooding occurred twice, while in November heavy rain and high winds caused lodging. Dry weather prevailed during harvesting in December-January, which was fortunate, as these months are usually those of heaviest rainfall.

Selection of Lembot Tembiling is contemplated but cannot be undertaken immediately. It is a popular variety of padi giving good yields and widely grown locally. Its yields in Latin Square trials this past season are very disappointing.

Tangkak Test Station.

An abnormally dry spell was experienced during July but only Milek Kuning 3 had then been sown. Other varieties were sown in August, and this resulted in Milek Kuning 3 being relatively too early for proper comparison in the Latin Square trial.

Tangkak Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	27.1	Siam 29 ...	30.00
Reyong 20 ...	25.9	Reyong 20 ...	27.2
Nachin 66 ...	18.2	Nachin 11 ...	15.5
Radin China 17 ...	23.6	Radin China 17 ...	23.8
Serendah Kuning ...	22.4	Serendah Kuning ...	25.2
S.D. = 1.2 M.S.D. = 1.8 lbs.		S.D. = 3.1 M.S.D. = 4.5 lbs.	

Siam 29 ...	27.9	Reyong 6 ...	25.0
Reyong 6 ...	24.9	Radin China 4 ...	24.6
Reyong 20 ...	24.4	" " 17 ...	23.8
Radin Siak 34 ...	19.1	Radin Siak 34 ...	20.6
S.D. = 2.6 M.S.D. = 4.5 lbs.		S.D. = 1.6 M.S.D. = 2.8 lbs.	

Nachin 66 ...	16.6	S.D. = 3.7 M.S.D. = 6.4 lbs.
Milek Kuning ...	13.6—sown early.	
Milek Puteh 148 ...	8.1—stem borer attack.	
Serendah Kuning ...	13.5	

Following heavy rains in October, flooding occurred on two occasions, but no damage resulted, while harvesting was completed in ideal conditions during the first week of March.

Tangkak and Jementah Padi Test Stations, both on medium heavy clay soil, are only about 20 miles apart in the north-west of Johore, and while for Tangkak, the highest average rainfall is in October, and for Jementah, in January, the occurrence of rainfall is very similar in trend. It is surprising, therefore, that the padi seasons should be so different, being from May to January at Jementah, and from August to March at Tangkak.

Some standardized trials with reciprocal dates of sowing would be of interest, and should be informative.

Tenglu Test Station.

This Test Station is situated in the north-east corner of Johore in the padi-growing district of Endau, with heavy rains in December and preparation of padi fields in March. Conditions are similar in many respects to those pertaining to several of the Test Stations in Pahang and the results of sowing-date experiments may apply here.

Critical experimentation has, however, been discontinued for the present until the problem of water control has been fully examined by the Drainage and Irrigation Department. An irrigation channel and water gates are being constructed, but will not be ready in time for the commencement of the 1939-40 season.

KELANTAN.

Kota Bharu Experiment Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Siam 29 ...	20.3	Singgora 19 ...	19.3
Reyong 6 ...	19.2	" 22 ...	18.0
" 20 ...	(16.3) 19.9	" 24 ...	(15.8) 19.4
Mayang Ebus 88 ...	20.3	" 29 ...	(15.8) 18.2
Radin China 4 ...	(10.8) 3 plots affected.	" bulked ...	(17.5) 20.0
Bird damage severe; not analysed.		Four abnormally poor sub-plots on high land; not analysed.	

Seraup 15 ...	20.5	Morak Sepilai 2 ...	21.0
" 36 ...	22.8	" 22 ...	23.2
" 371 ...	22.2	" 26 ...	23.9
" 146 ...	23.4	" 28 ...	21.7
Mayang Kuning 48 ...	24.8	" Unselected ...	21.2
S.D. = 2.0 M.S.D. = 2.9 lbs.		S.D. = 1.2 M.S.D. = 1.8 lbs.	

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Padang Trengganu 9 ...	19.0	Mayang Sagumpal 2 ...	15.9
" 11 ...	16.1	" " 14 ...	18.4
" 22 ...	20.2	" " 16 ...	19.6
" 27 ...	17.3	" " 33 ...	15.6
" Unselected	17.3	" Unselected ...	17.3
S.D. = 1.2 M.S.D. = 1.8 lbs.		S.D. = 1.4 M.S.D. = 2.1 lbs.	

The first two Latin Squares are of 6 months varieties of padi, while the rest are of 7 months varieties. The 6 months varieties, although sown (24th July-11th August) at a reasonable time after the 7 months varieties (3rd July-20th July), again ripened before them and suffered damage from birds. The worst sufferer was Radin China 4, newly introduced from Kedah. Further slight readjustments of sowing dates will be made.

The Experiment Station is on medium heavy clay and Krian-selected Seraups continue to be satisfactory, including the recent introduction Mayang Kuning 48 and Seraups 146 and 371, while Siam 29 is also well suited to Kota Bahru conditions.

Seraup 86 and Siam 29 will be given extensive field trials in all five districts during the 1939-40 season.

Morak Sepilai selections 22 and 26 are quite satisfactory also, while Padang Trengganu 22 remains the best of that variety.

Pure-line Selection.

The following varieties of wet padi were undergoing selection:

Variety	No. of Lines	Selection commenced	Maturation Period in days.
Padang Trengganu ...	4	1934 - 35	214 to 217
Morak Sepilai ...	4	1935 - 36	221 to 223
Mayang Segumpal ...	7	"	217 to 219
Singgora ...	6	"	186 to 193
Anak Naga ...	10	"	186 to 197
Nalong ...	32	1937 - 38	217 to 223
Manek Siam ...	35	"	218 to 221

Padang Trengganu.—There seems little doubt that P.T.22 is the best of the selections for the heavier types of soil. At Kota Bharu, it has headed the lines for two years at over 100 gms. per plant, while it has also yielded best in the Latin Square trials. This strain will be multiplied next season to obtain seed for extended trials on raiats' land in the heavy soil areas. As regards the light soil areas, a Latin Square trial was laid down this season at Pasir Puteh but has been badly damaged by rats. P.T.9, 11 and 27 will be retained as well as 22 until the position at Pasir Puteh is clear.

Morak Sepilai.—From Latin Square trials laid down for the first time this season and from the last two seasons in the lines, it would appear that Mor. S. 22 and 26 are the pick of the four lines remaining, but further confirmation is desirable.

Mayang Segumpal.—The strain M.S.G. 16 has been outstanding for the past two seasons in the lines and also headed the Latin Square trial laid down for the first time this season. The next best is M.S.G. 14. A further season in the Latin Square is desirable to make absolutely certain, but in the meantime M.S.G. 16 can be multiplied with a view to trials by cultivators.

Singgora.—Latin Square trials were laid down for the first time this season but have merely served to complicate matters by giving diametrically opposite results to those obtained in the lines. The four best strains appear to be S.19, 22, 24 and 29 but none of them is outstanding and it may be that this variety, which is not a local but a Siamese one, is not well suited to local conditions. If this is so it is unfortunate as it is a first class type in many ways. Latin Square trials and the four best lines will be continued next season to obtain further information.

Anak Naga.—This variety is proving difficult to select as it appears to be very susceptible to damage by birds, and for the past four seasons the ear-to-row selection work has been complicated and upset by this factor. A Latin Square trial will be laid down next season with Ak.N. 2, 13, 37 and 38 and these strains kept on in the lines with the addition possibly of Ak.N. 1 and 11. Latin Square trials should give a better idea of whether there is anything really outstanding but the general impression is that this variety, although possessing a splendid grain, seldom yields really well in the field.

It is an unfortunate fact that in Kelantan the really adaptable varieties are those possessing grains of moderate or poor type, *e.g.* Manek Siam, Nalong, Padang Trengganu, Mayang Segumpal.

Nalong.—Very good yields were again obtained in the lines, thirteen of which averaged over 100 gms. per plant. At least one more year of elimination in the lines will be necessary before Latin Square trials are begun. Sixteen lines are suggested for retention next season, *viz.* Ng. 10, 15, 17, 22, 28, 29, 30, 32, 33, 34, 41, 42, 44, 45, 46 and 50.

Manek Siam.—Yields were hardly as good as last season. This variety is at the same stage of selection as Nalong and further elimination in the lines will be necessary before Latin Square trials are begun. Fourteen lines are suggested for retention next season, as follows:—Man. Sm. 13, 14, 21, 34, 35, 37, 38, 39, 41, 42, 43, 44, 45 and 46.

Dry-land Padi.

The following varieties of dry-land padi were undergoing selection:—

Variety	No. of Lines	Selection commenced	Maturation Period in days.
Muar Pa'Dok ...	6	1934-35	179 to 183
Padang Serai ...	5	"	174
Sa Bumi Puteh ...	7	"	174
Jintan Koring ...	7	"	179
Kaki Merpati ...	7	"	179 to 183

Muar Pa'Dok.—M.P.D. 5, 26, 28 and 30 seem to be the best lines and will go into a Latin Square trial next season. The remaining lines can safely be discarded.

Padang Serai.—The situation has been complicated rather than clarified by this season's Latin Square trials. These will be repeated next season and only the 4 strains concerned, P.S. 1, 7, 15 and 28, retained in the lines.

Sa Bumi Puteh.—Here again the Latin Square trial has not helped matters and will have to be repeated next season. Only the 4 strains concerned, viz. S.B.P. 1, 3, 9 and 11, need to be retained in the lines.

Jintan Koring.—A Latin Square will be made up next season comprising J.K. 7, 8, 21 and 26 and the remainder discarded.

Kaki Merpati.—Latin Square trials can be commenced next season comprising K.M. 2, 5, 31 and 33 and the remaining lines discarded.

Varietal Survey.

The collection and examination of ears of the more important varieties from each *daerah** is being continued. On completion of this it should be possible to indicate which varieties should be concentrated on from the point of view of selection.

Selection will be on the broadest possible basis from the start; re-selection on a wider basis of varieties at present in ear-to-row lines may be necessary; and a multiplicity of varieties undergoing selection at any one time should be avoided.

Pasir Mas Test Station.

The season has again been a poor one owing to lack of early water supply, and it is not worth while giving details of results of experiments as yields were so low as to be of very little value.

* *daerah* = district.

Two seasons' experience at this Station have amply demonstrated the difficulties met with in growing padi on fairly good but rather high-lying land, without irrigation facilities.

Furthermore, the rainfall recorded during the past two years indicates great variation in seasonal fall and distribution. The distribution, too, shows that much of the total rainfall must have been lost in "run-off". For instance, in September 1938 there were over 8 ins. of rainfall, but of this over 5 ins. fell in 3 days at the commencement of the month, and by the 6th October the land had practically dried out. In November 22.9 ins. of rain fell, but over 17 ins. of this fell between the 16th and 21st days of the month.

A number of strains of Radin, Reyong, Siam, Seraup and local varieties were tried this season but the only varieties to yield anything like a reasonable crop were late planted (November) Anak Naga and Anak Ikan.

Anak Ikan is a locally popular late short-term variety of padi, and it is possible that this Station may eventually become the centre for selection work on the late short-term varieties which are of such importance, locally, on account of the large areas of unirrigated high-lying land.

Pasir Puteh Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Manek Siam ...	18.2	Padang Trengganu 9 ...	13.8
Nalong ...	13.7	" 11 ...	11.0
Chantek ...	12.1	" 22 ...	17.9
Rambutan ...	12.4	" 27 ...	14.4
Padang Trengganu ...	15.9	" Unselected	15.8
S.D. = 2.1 M.S.D. = 3.1 lbs.		S.D. = 2.0 M.S.D. = 2.9 lbs.	

Reyong 6 ...	17.8	Padang Trengganu 22	15.0
Siam 29 ...	17.1	Mayang Kuning 48 ...	15.1
Mayang Ebus 80 ...	17.7	Mayang SaBatil 8 ...	13.3
Radin China 4 ...	15.9	Seraup 371 ...	10.8
S.D. = 1.0 M.S.D. = 1.7 lbs.		S.D. = 1.9 M.S.D. = 3.3 lbs.	

Yields are below those of the previous season owing to less favourable weather, with light and unevenly distributed rainfall.

There was considerable rat damage in sub-plots of the Padang Trengganu Latin Square.

The soil of this Station is light and sandy and Mayang SaBatil and Seraup 371, selected in the heavier, well watered soil of Krian, have not done well with the lack of adequate rainfall this season.

Bachok Test Station.

This Test Station is on sandy coastal soil, some 12 miles south-east of Kota Bharu and is entirely dependent on rainfall.

Work at present is being confined to manurial experiments, and this season organic manures and rock phosphate have given significant increases in yields.

Melor Experiment Station.

The new Station will soon be opened to accommodate all dry-land padi experiments and selection work.

BRUNEI AND LABUAN.

Kilanas Experiment Station.

The varietal trials at Kilanas were all sited in an area where a predominance of peaty soil causes poor growth and yield and the poor results of the 1938-39 season are probably representative of the yield of padi possible on soil of this type.

Although the varietal trials' yields were low, there was less pest damage than in previous years and the figures showed a greater degree of uniformity than in previous seasons. Statistical analysis of the results was not justified but the figures again showed that the Seraup strains of padi, as well as Siam 29 and the local variety Jongkok are likely to be the most successful. On the figures recorded it was impossible to say which of the Seraups appeared best at this Station, as the mean yields were all approximately the same (9 lbs. per 1/120th acre).

Arrangements have been made for the varietal trials in future years to be sited on an adjoining area where the soil is much more suitable for wet padi.

Pure-line Selection.

Selection work of local varieties continued as indicated below:—

Variety	Series	Season	Lines under Observation.	Lines Retained
Jongkok ...	1	Third ...	43	39
" ...	2	First ...	30	28
Radin Pasir ...	1	Third ...	30	28
Arat ...	1	" ...	11	11
" ...	2	First ...	20	20
Limbu ...	1	Second ...	23	17
Anusan ...	1	First ...	30	28
Langsat Kuning ...	1	Second ...	17	17
" " ...	2	First ...	30	27
Langsat Puteh ...	1	Second ...	12	12

Lumapas Test Station.

Variety	Mean Yield per 1/120th acre in lbs.	Variety	Mean Yield per 1/120th acre in lbs.
Mayang Kuning 48 ...	13.1	Mayang Kuning 48 ...	10.0
Seraup 15 ...	13.3	Seraup 36 ...	10.8
Seraup 48 ...	16.5	" 146 ...	9.1
" 146 ...	14.0	" 371 ...	9.4
Jongkok ...	16.4	Jongkok ...	14.3
By inspection, no significant differences.		By inspection, Jongkok superior to selected strains.	

Jongkok ...	22.3	Milek Kuning 3 ...	16.0
Limbu ...	15.7	Radin 11 ...	14.8
Langsat ...	10.4	" 13 ...	13.4
Arat ...	10.4	Mayang Ebus 88 ...	14.8
Anusan ...	11.5	" " 209 ...	12.4
S.D. = 2.0 M.S.D. = 2.9 lbs.		S.D. = 1.9 M.S.D. = 2.6 lbs.	

There was a great deal of rat damage throughout the season and the Krian Seraup selections and Mayang Kuning 48 have given not nearly as good yields as in previous seasons. The local padi Jongkok shows up very well, also the Pahang variety, Milek Kuning 3.

Kuala Abang Test Station.

Padi plants at this Station also suffered greatly from rat damage, and yields are too low to be worth inclusion here. Siam 29 and Mayang Ebus 88 with yields of 12 lbs. and 11.4 lbs. respectively per 1/120th acre were much the best.

Brunei has only recently begun to change over from dry padi to wet padi planting methods and experimental work is particularly difficult owing to the liability to pest damage.

Berakas Test Station.

This Test Station has now been abandoned, and a new one at Paya Bakong has been commenced in its place.

Bukit Kallam Padi Station (Labuan).

Owing to pest damage yields of sub-plots in the Latin Square varietal trials vary excessively, and the results are of no significance. Siam 29 appeared to be the least affected.

In multiplication plots Milek Puteh 148 gave excellent yields, also Seraup 146 and Siam 29.

Selection work is being carried out on the local varieties Siam, Acheh, Rangoon and Piassau.

SUMMARY.

Kedah.

In contrast with the 1937-38 season the 1938-39 season was a very good one. The season in general was notable for the harvesting of a record crop, while varietal trials at the Test Stations enhanced the reputation of Mayang Ebus 80 as the leading selected strain for average Kedah conditions.

Selection work with selected strains of the varieties Serendah Sungei Dua and Mayang Tekai continues to produce satisfactory results.

It appears to be established that Reyong 20 is very liable to suffer severe rat damage, presumably on account of the succulence of its stems.

Penang.

The local variety Mayang SaBatil continues to be successful.

Province Wellesley.

A good season was experienced. Mayang Ebus 80 and Reyong 6 continue to give satisfactory yields and are gaining in popularity in the Central and Northern Districts. Selection of two local varieties is to be initiated.

In South Province Wellesley, the Sungei Acheh padi-growing area has greatly benefited by its inclusion in the Krian Irrigation Scheme, but the supply of water for this season was somewhat below the optimum.

Perak, Krian District.

A recent selection, Mayang SaBatil 8, has everywhere proved itself very satisfactory as regards yields, and being of a good milling type is regarded as being of much promise. Reports after harvest, however, revealed the fact that it was somewhat difficult to thresh and it may not become popular on this account.

Planting distance experiments are being continued, largely in connexion with a correlation of selection methods and field practice.

Perak (General).

At Bukit Gantang and Bruas, Siam 29, in a season which did not favour early sown Seraups but which was otherwise satisfactory, gave good yields.

At Talang Experiment Station, Mayang Ebus selections were again very good.

At Sungei Manik, Mayang SaBatil 8 and Seraup strains were good, as expected.

Selangor.

Of by far the greatest importance are the progress of the Sungei Tenggi Irrigation Scheme in Kuala Selangor and the fact that the Tanjong Karang-Panchang Bedena area of 45,000 acres, which it will serve, is good padi soil and may confidently be expected to give relatively high yields when irrigation water is adequately available.

Negri Sembilan.

A good season was experienced. Adjustment of sowing dates continues, and adjusted sowing dates may have been partly responsible for the greatly improved yields at the Test Stations this season.

Pahang.

There are two chief distinctions in the padi-growing lands of Pahang, namely the irrigated, terraced *sawah* of the Raub and Lipis Districts, and the *paya-paya* or swamps along Pahang River, which have no assured water supply.

The chief work at present in hand is experimentation of optimum sowing dates at the *sawah* Test Stations, Dong and Kuala Lipis, also Sungei Blat and Pahang Tua.

These experiments are being extended to the *paya* Test Stations as observations in conjunction with puddling and other trials in *paya* management.

Malacca.

Selection work and seed distribution remain the most important functions of the Pulau Gadong Experiment Station. Siam 29, Nachin 11 and Milek Puteh 9 are the highest yielding and most popular strains.

Shortage of water in the coastal areas of padi land was particularly severe this season, and very low yields were obtained wherever irrigation water was not available.

Insect pests did much damage to late ripening padi.

Kelantan.

The season at Kota Bahru Experiment Station was a satisfactory one, but dry weather, generally, militated against good crops in many padi-growing areas in the State.

A survey of varieties of padi is being continued, and, as a result, selection of the most important wet-land varieties may be recommenced on a wider basis.

Dry-land padi experiments will be separately carried out at a new Experiment Station, and selection of late short-term wet-land varieties may be instituted.

Johore.

A good padi season was experienced. Very satisfactory yields were harvested at Tangkak Test Station, and Siam 29 was the most successful variety at both Tangkak and Jementah.

Local irrigation and drainage schemes are being carried into effect.

Brunei and Labuan.

Damage by pests, chiefly rats, was very considerable this season, and results of varietal trials are of little value. Work at the several Padi Stations is, however, achieving results in the gradually extending area of land being converted to cultivation of wet-land padi.

Received for publication 24th November, 1939.

Journal of the Malayan Agricultural Society, Vol. 12, No. 4, 1939, pp. 512-513. Printed at Singapore on 24th November, 1939.

PADI MANURIAL AND MINOR CULTURAL TRIALS, SEASONS 1937-1938 AND 1938-1939

Compiled by
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The general position in regard to padi manurial trials from 1930 to 1935 has been previously summarized.* Trials carried out during the 1936-37 season have also been recorded.†

There follows an account of certain trials carried out during the two seasons 1937-38 and 1938-39.

Season 1937 - 1938.

Heavy Phosphate Trials.

The Heavy Superphosphate and Rock Phosphate Dust Trials which were planted for residual effect in the 1936-37 season were examined for further residual effect of the phosphate dressings in combination with heavy dressings of nitrogen.

Nitrogen was applied as ammonium sulphate in three equal applications, 1 week before transplanting, 6 weeks after transplanting and 10 weeks after transplanting. Results are given in Tables I and II.

Table I.
Heavy Superphosphate Residual plus Heavy Nitrogen.

Mean Yield in lbs. per 1/360th acre.

Station	Total Ammonium Sulphate per acre	Superphosphate per acre			
		Nil	16 cwts.	32 cwts.	48 cwts.
Bagan Serai ...	5	3.8	4.3	5.2	5.5
Kuala Kurau ...	"	5.5	5.3	4.5	5.1
Pulau Gadong ...	"	3.9	3.7	3.7	3.7
Kendong ...	"	1.8	2.0	1.8	2.1
Briah ...	10	3.1	2.7	2.6	2.6
Sungei Kepar ...	"	1.6	1.2	1.1	1.1
Bukit Merah ...	"	1.6	4.7	5.4	4.7
Talang ...	"	9.7	10.5	9.3	8.7
Selinsing ...	15	1.7	1.9	2.3	3.2
Titi Serong ...	"	8.2	8.6	8.4	7.5
Telok Chengai ...	"	6.4	4.9	4.4	4.1

* *Malayan Agricultural Journal*, Vol. XXIV, page 629, December, 1936.

† *Malayan Agricultural Journal*, Vol. XXV, page 525, December, 1937.

Table II.
Heavy Rock Phosphate Residual plus Heavy Nitrogen.
 Mean Yield in lbs. per 1/360th acre.

Station	Total Ammonium Sulphate per acre	Rock Phosphate per acre			
		Nil	16 cwts.	32 cwts.	48 cwts.
Bagan Serai ...	5	3.2	3.7	3.3	3.6
Kuala Kurau ...	"	6.4	6.3	5.9	6.0
Pulau Gadong ...	"	5.1	3.9	4.0	4.6
Kendong ...	"	4.0	3.6	2.5	2.3
Briah ...	10	2.2	2.6	3.4	3.3
Sungei Kepar ...	"	1.8	2.1	1.4	1.6
Bukit Merah ...	"	1.9	4.4	4.7	5.2
Talang ...	"	12.2	11.7	10.7	12.6
Selinsing ...	15	2.4	1.7	1.5	1.2
Titi Serong ...	"	7.8	7.5	7.2	6.7
Telok Chengai ...	"	6.1	5.2	4.7	3.9

A comparison of these tables with those given in previous records* shows that the 1937-38 yields are low. Reports from many Stations, however, indicated considerable damage due to lodging and rats.

Only at Bukit Merah were any significant differences obtained, but the yields of the control plots were so low that the results were regarded with suspicion. It should be noted here, however, that the experiment was repeated in the 1938-39 season and the results obtained confirmed the significant differences shown at this Station.

Insoluble Nitrogen and Phosphate Trials.

These experiments which were initiated in the 1936-37 season† were replanted on the same five Stations for residual effects.

With the exception of Telok Chengai, yields were lower than in the previous season and no significant differences emerged. At Telok Chengai there appeared to be a slight significant residual increase due to nitrogen.

* *Malayan Agricultural Journal*, Vol XXIV, page 622, and Vol. XXV, page 527.

† *Malayan Agricultural Journal*, Vol. XXV, page 526.

Table III.
Insoluble Nitrogen and Phosphate Trials Residual Effects.
 Mean Yield in lbs. per 1/360th acre.
Telok Chengai.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwts.	5 cwts.	
No nitrogen ...	7.9	8.9	9.2	8.7
11 cwts. ground horn. ...	8.8	9.7	9.6	9.3
22 " " " ...	10.0	9.8	10.5	10.1
Mean ...	8.9	9.5	9.8	9.4

Titi Serong.

No nitrogen ...	6.5	6.2	6.3	6.3
11 cwts. ground horn. ...	6.4	7.0	6.7	6.7
22 " " " ...	6.8	6.5	7.2	6.9
Mean ...	6.6	6.6	6.8	6.6

Talang.

No nitrogen ...	10.8	9.2	8.9	9.6
11 cwts. ground horn. ...	10.0	9.7	9.4	9.7
22 " " " ...	9.6	9.3	10.1	9.6
Mean ...	10.1	9.4	9.5	9.7

Pulau Gadong.

No nitrogen ...	5.7	5.8	5.6	5.7
11 cwts. ground horn. ...	5.6	6.2	5.4	5.8
22 " " " ...	5.2	4.4	5.1	4.9
Mean ...	5.5	5.5	5.3	5.5

Kota Bharu.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwt.	5 cwt.	
No nitrogen ...	6.7	6.9	6.8	6.8
11 cwt. ground horn. ...	6.6	6.1	6.5	6.4
22 " " " ...	6.9	6.9	6.8	6.9
Mean ...	6.8	6.6	6.6	6.7

Heavy Green Dressing and Phosphate Trials.

These trials were initiated at six Stations. The lay-out was similar to that of the Insoluble Nitrogen and Phosphate Trial,* with the substitution of 20, 40 and 60 tons of green matter in place of the nitrogen dressings. The green dressings were allowed 1 month to rot down before planting commenced.

It will be seen from Table IV that no effects were evidenced at five out of the six Stations, and at the sixth, Telok Chengai, the green dressings appeared to have a significant depressing effect on yield.

Table IV.
Heavy Green Dressing and Phosphate Trials.

Mean Yield in lbs. per 1/860th acre.

Kota Bharu.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwt.	5 cwt.	
20 tons green manure ...	7.9	8.2	8.5	8.2
40 " " " ...	8.3	8.7	7.8	8.3
60 " " " ...	7.4	7.5	7.9	7.6
Mean ...	7.8	8.1	8.1	8.0

Telok Chengai.

20 tons green manure ...	10.4	7.8	9.2	9.2
40 " " " ...	7.4	6.6	5.3	6.3
60 " " " ...	4.4	6.1	4.2	4.9
Mean ...	7.3	6.9	6.3	6.8

* *Malayan Agricultural Journal*, Vol. XXV, page 525.

Pulau Gadong.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwts.	5 cwts.	
20 tons green manure ...	6.9	7.6	7.9	7.5
40 " " " ...	7.2	7.9	7.9	7.7
60 " " " ...	6.7	7.2	7.8	7.3
Mean ...	7.0	7.6	7.9	7.5

Briah.

20 tons green manure ...	5.0	4.2	4.6	4.6
40 " " " ...	5.3	4.5	4.9	4.9
60 " " " ...	4.7	4.2	5.0	4.6
Mean ...	5.0	4.3	4.8	4.7

Talang.

20 tons green manure ...	10.3	9.8	9.6	9.9
40 " " " ...	8.3	9.9	9.5	9.2
60 " " " ...	9.6	8.6	9.8	9.3
Mean ...	9.4	9.4	9.6	9.5

Selinsing.

20 tons green manure ...	3.2	4.1	3.7	3.7
40 " " " ...	3.1	3.5	3.3	3.3
60 " " " ...	2.2	2.3	2.3	2.3
Mean ...	2.8	3.3	3.1	3.1

Minor Experiments.

Many minor cultural or manurial experiments were carried out on various Stations. Of these the following showed significant effects or were of particular interest.

At Selinsing the practice of changkolling wet or dry for two seasons showed significant effects over tajaking. The results are shown in Table V.

Table V.
Cultivation Experiment, Selinsing.
Mean yield in lbs. per 1/120th acre.

Treatment	lbs.	
A. Changkol dry 1936-37 ...	10.8	S.D.† = 1.2 lbs. = 10.6% of general mean.
B. " " " and 1937/38 ...	13.5	
C. " wet " ...	10.6	M.S.D. = 1.7 lbs.
D. " " " and 1937/38 ...	11.4	
E. Tajak* " " " ...	9.7	
Mean ...	11.2	

At Pulau Gadong an experiment on the period of preparation of the land initiated in 1936-37,‡ was repeated. Results, which are shown in Table VI, were not significant.

Table VI.
Preparation of Land Experiment, Pulau Gadong.
Mean yield in lbs. per 1/100th acre.

Land prepared 4 weeks before planting ...	12.6
" " 6 " " " ...	13.9
" " 8 " " " ...	12.2
Mean ...	12.9

* Scything weed growth with a local tool called a *tajak*.

† S.D. = Standard Deviation.

M.S.D. = Minimum Significant Difference.

‡ *Malayan Agricultural Journal*, Vol. XXV, page 531.

At Telok Chengai an experiment on the disposal of straw gave no significant results. When phosphate was added after a burn, however, a significant increase was obtained.

Table VII.
Disposal of Straw Experiment, Telok Chengai.

Mean yield in lbs. per 1/45th acre.

Straw removed with stubble	...	69.2	S.D. = 2.7 lbs. = 3.7% of general mean. M.S.D. = 4.8 lbs.
Straw burnt	...	73.5	
Straw spread	...	74.1	
Straw burnt and 250 lbs. guano added	...	77.0	
Mean		73.5	

At Titi Serong an experiment on the disposal of straw gave no significant results. The experiment differed from that at Telok Chengai in that the straw was cut only about one third down its length whereas at Telok Chengai it was cut at ground level.

Table VIII.
Disposal of Straw Experiment, Titi Serong.

Mean yield in lbs. per 1/10th acre.

Straw burnt	...	225.5
Straw spread at <i>menajak</i> *	...	220.9
Straw spread at harvest	...	225.2
Straw removed	...	225.1
Mean		224.9

* *Menajak* = clearance of weed growth preparatory to padi planting.

At Kota Bharu, a manurial experiment indicated significant responses to added nitrogen.

Table IX.
Manurial Experiment, Kota Bharu.
Mean yield in lbs. per 1/120th acre.

Treatment per acre.	lbs.	
Control	19.2	
2 cwts. ground horn	22.1	S.D. = 1.8 lbs. = 8.2% of general mean. M.S.D. = 2.6 lbs. I.C.* = 2.1 lbs.
" " " and 2 cwts. phosphate ...	22.7	
2 cwts. phosphate and 1½ cwts. ammonium sulphate in two dressings	23.7	
2 cwts. phosphate and legume turned in. ...	20.2	
Mean ...	21.6	

At Pasir Puteh, Kelantan, a manurial experiment, which was damaged by rats, showed no significant results but strong indications that the Station was responsive to manuring.

Table X.
Manurial Experiment, Pasir Puteh.
Mean yield in lbs. per 1/40th acre.

Treatment per acre.	lbs.
Control	47.8
2 cwts. rock phosphate	60.5
" " " and 2 cwts. ground horn	64.7
" " " and green manure	64.6
" " " and 1½ cwts. ammonium sulphate in two dressings	62.0
Mean ...	59.9

*I.C. = Increase over control plot necessary to attain significance.

At Bachok, Kelantan, two manurial experiments carried out indicated that the Station is likely to be responsive to manuring, particularly nitrogen.

Table XI.
Manurial Experiment, Bachok.

Mean yield in lbs. per 1/60th acre.

Treatment per acre		lbs.
1936-37.	1937-38.	
A. $\frac{1}{2}$ cwt. phosphate	2 cwts. rock phosphate ...	9.9
B. 1 " " "	1 " " " ...	11.6
C. 2 cwts. " "	Residual ...	14.5
D. Control	Control ...	10.1
	Mean ...	11.5
S.D. = 2.3 lbs. = 20% of general mean. M.S.D. = 4.0 lbs. I.C. = 3.2 lbs.		

Table XII.
Manurial Experiment, Bachok.

Mean yield in lbs. per 1/60th acre.

Treatment per acre		lbs.
1936-37.	1937-38.	
A. Proprietary fertilizer	Control ...	16.1
B. 1 cwt. rock phosphate	2 cwts. rock phosphate ...	17.5
C. 1 cwt. superphosphate	5 tons green manure ...	18.9
D. Control	2 cwts. rock phosphate and 1½ cwts. ammonium sulphate ...	29.6
	Mean ...	20.5
S.D. = 3.4 lbs. = 16.6% of general mean. M.S.D. = 5.95 lbs.		

Season 1938 - 1939.

Heavy Green Dressing and Phosphate Trials.

These trials, initiated the previous season, were replanted for examination of residual effects. Results are given in the following tables, which, compared with those given in Table IV, show great differences in seasonal effects but no effect of the treatments.

Table XIII.
Heavy Green Dressing and Phosphate Trials, Residual.

Mean yield in lbs. per 1/360th acre.

Kota Bharu.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwts.	5 cwts.	
20 tons green manure ...	6.6	6.6	6.5	6.6
40 " " " ...	7.2	7.0	7.0	7.1
60 " " " ...	6.4	6.7	6.9	6.7
Mean ...	6.7	6.8	6.8	6.8

Telok Chengai.

20 tons green manure ...	12.6	12.3	13.1	12.7
40 " " " ...	13.8	14.3	14.3	14.1
60 " " " ...	13.6	12.9	12.3	13.0
Mean ...	13.4	13.2	13.3	13.3

Pulau Gadong.

20 tons green manure ...	5.8	6.2	5.9	6.0
40 " " " ...	5.8	5.9	6.0	5.9
60 " " " ...	5.7	6.3	6.1	6.1
Mean ...	5.8	6.1	6.0	6.0

Briah.

Treatment per acre	Rock Phosphate			Mean
	Nil	2 cwts.	5 cwts	
20 tons green manure ...	6.2	5.5	5.8	5.8
40 " " " ...	6.3	5.9	5.2	5.8
60 " " " ...	6.0	6.1	6.0	6.0
Mean ...	6.2	5.8	5.7	5.9

Talang.

20 tons green manure ...	7.8	9.9	9.5	9.1
40 " " " ...	9.1	9.4	10.1	9.5
60 " " " ...	7.6	9.1	10.8	9.2
Mean ...	8.2	9.5	10.2	9.3

Minor Experiments.

Other experiments carried out during the season were either special experiments designed for certain Stations or minor cultural trials.

At Pulau Gadong two experiments were of interest; the cultivation experiment carried out the previous year (Table VI) was repeated with the following result.

Table XIV.
Cultivation Experiment, Pulau Gadong.

Mean yield in lbs. per 1/100th acre.

Land prepared 4 weeks before planting ...	20.4
" " 6 " " " ...	19.7
" " 8 " " " ...	19.0
Mean ...	19.7

The differences are not statistically significant.

The second experiment was designed to test the effect of running off water during growth, in combination with the application of manures at such times. The lay-out was 1/120th acre strips replicated three times with the following treatments:

- A. Control, no manures applied, water left on the whole season.
- B. Control, no manures applied, water run off early and late during the growing season.
- C. Nitrogen and phosphate dressings applied before planting, water left on the whole season.
- D. Nitrogen and phosphate dressings applied before planting, water run off early and late during the growing season.
- E. Nitrogen and phosphate dressings applied before planting, and early and late during the growing season at the same time as the water was run off.

Nitrogen dressings totalled $1\frac{1}{2}$ cwts. of ammonium sulphate per acre, and phosphate dressings 2 cwts. of rock phosphate per acre.

The results obtained are shown in Table XV.

Table XV.

Pulau Gadong.

Mean yield in lbs. per 1/360th acre.

Treatment		lbs.
A	...	19.2
B	...	18.6
C	...	18.8
D	...	18.5
E	...	17.7
Mean ...		18.6

At Telok Chengai the continued experiment on the method of disposal of straw almost attained statistical significance (*cf.* Table VII).

Table XVI.

Disposal of Straw Experiment, Telok Chengai.

Mean yield in lbs. per 1/45th acre.

Straw removed with stubble	...	68.8	S.D. = 4.45 lbs. = 6% of general mean. M.S.D. = 7.75 lbs.
Straw burnt	...	75.2	
Straw spread	...	75.5	
Straw burnt and 250 lbs. guano added	...	77.0	
Mean	...	74.1	

Table XIX.**Bat Guano Experiment, Kota Bharu.**

Mean yield in lbs. per 1/120th acre.

Treatment per acre		lbs.
1 cwt. bat guano	...	17.0
2 cwt. „ „	...	17.6
3 „ „ „	...	17.9
Control — no manure	...	15.7
Mean		17.05
S.D. = 0.88 lb. = 5.2% of general mean. M.S.D. = 1.54 lbs. I.C. = 1.2 lbs.		

Table XX.**Dry Padi Cultivation and Manurial Experiment, Kota Bharu.**

Mean yield in lbs. per 1/120th acre.

Control—no treatment	...	6.7	S.D. = 1.24 lbs. = 13.4% of general mean. M.S.D. = 2.16 lbs. I.C. = 1.70 lbs.
Deep late changkol	...	11.2	
Added legume and phosphate	...	7.0	
Deep late changkol and added legume and phosphate	...	12.0	
Mean	...	9.2	

This experiment showed a very high significant effect of changkolling. The influence of changkolling is also shown in the following experiment.

Table XXI.
Dry Padi Cultivation Experiment, Kota Bharu.

Mean yield in lbs. per 1/80th acre.

Treatment			lbs.
1936.	1937.	1938.	
Changkol early	Plough and harrow	Plough and harrow ...	6.6
Changkol late	-do-	-do- ...	5.7
Plough and harrow	-do-	-do- ...	4.7
Changkol late	Changkol late	-do- ...	8.7
Changkol early	Changkol early	-do- ...	8.2
Mean ...			6.8
S.D. = 1.4 lbs. = 20% of general mean. M.S.D. = 2.0 lbs.			

At Bachok, Kelantan, significant results were obtained in two manurial experiments.

Table XXII.
Manurial Experiment, Bachok.

Mean yield in lbs. per 1/60th acre.

Treatment per acre	lbs.	
Control	23.8	S.D. = 2.07 lbs. = 6.8% of general mean. M.S.D. = 3.6 lbs.
2 cwts. rock phosphate	31.2	
5 tons green manure	32.5	
2 cwts. rock phosphate + 1½ cwts. ammonium sulphate in two dressings	34.1	
Mean ...	30.5	

Table XXIII.
Manurial Experiment, Bachok.
 Mean yield in lbs. per 1/60th acre.

Treatment per acre.	lbs.	
Control	21.6	S.D. = 2.07 lbs. = 7.1% of general mean. M.S.D. = 3.6 lbs.
3 tons bush loppings	28.7	
3 tons compost	30.4	
2 tons cattle manure	35.1	
Mean	28.9	

Table XXIV.
Manurial Experiment, Pasir Puteh.
 Mean yield in lbs. per 1/40th acre.

Treatment per acre.	lbs.
Control	40.8
2 cwts. rock phosphate	47.6
" " + 2 cwts. ground horn	53.6
" " + 5 tons green manure	51.8
" " + 1½ cwts. ammonium sulphate in two dressings	51.3
Mean	49.0
S.D. = 4.0 lbs. = 8.15% of general mean. M.S.D. = 5.16 lbs.	

This experiment which was a repetition of that carried out in the previous season (Table X), showed that the earlier conclusion then made was correct.

Summary.

After nine seasons' experimental work on the manuring of padi in Malaya, the amount of positive information gained is small, the amount of negative information great.

A study of the results of the experiments published from time to time in this Journal will show that the subject has had exhaustive treatment.

Experiments have covered all types of artificial manuring in varying quantity, organic manuring, methods of cultivation of the land and many combinations of these factors.

From the mass of accumulated data one fact is certain and two general conclusions seem justified. The fact is that as yet we have no indication of the nature of the factor which apparently limits the yield of padi in this country; the first conclusion reached is that the padi soils of the western side of the Peninsula are only slightly responsive to manuring, such response as there is being mainly to phosphate manures, and the increases which can be obtained are not economic; the second conclusion is that excellent response to manuring can be obtained on Kelantan padi soil, nitrogen, as well as phosphate, having a marked effect.

It would now appear that the immediate limit of usefulness of field manurial experiments to raise the yield of the western padi soils has been reached. It would, therefore, seem opportune to discontinue such experiments until further work has suggested new lines of attack on the problem.

Much, however, can be done on the eastern padi soils in determining the most suitable and economic fertilizer dressings for the different districts.

Received for publication 28th November, 1939.

Departmental.

FROM THE DISTRICTS.

Compiled in the Office of the Chief Field Officer from Monthly Reports of Agricultural Officers.

November, 1939.

The Weather.

In Kedah, North Perak and Penang heavy rain occurred and the total precipitation for the month was up to normal. In other parts of the country, although there were adequate falls in most places, the total rainfall for the month was rather below the average.

Crop Reports.

Rubber.—Prices continued to rise during November; in most places the price of best quality sheet touched \$50 per picul, and at centres such as Penang and Singapore was even higher. There have been severe outbreaks of mouldy rot disease in most places; this is only to be expected as a result of the combination of wet weather and increased tapping.

All classes of rubber producers are experiencing great difficulty in obtaining supplies of coagulants. Supplies of formic and acetic acids are at the moment short. Assistance has been given by Departmental Officers to small-holders to obtain supplies.

Fermented coconut milk makes a satisfactory coagulant and the Rubber Research Institute have carried out experiments on how best it can be used for this purpose and are preparing a pamphlet of instructions which will be available shortly for the guidance of small-holders and others.

Padi.—Reports generally indicate that prospects for a good harvest are favourable. In response to the country's need for foodstuffs padi cultivators have made special efforts to plant up an increased area of land. In all districts there appears to have been an increase in the total acreage under cultivation.

Conditions in Malacca continue to be difficult. In the coastal areas the first part of the month was very dry which set back the late-planted padi.

A considerable acreage in Malacca was destroyed in the October floods. This was the last of a series of set-backs that have occurred. In the ordinary course of events cultivators would have given up trying to get a crop this season. However, the Collector of Land Revenue and the Agricultural Officer made every effort to get the vacant areas planted up again; 100,000 bundles of surplus seedlings were collected from more distant places, which had not been affected by the flood, and were distributed to cultivators. In this way 300 acres were replanted.

In Stage IV at Sungei Manik, work on felling is about to begin. A village has been established on the northern boundary and accommodation has been provided for a labour force of some 1,000 men: 160 settler-labourers have already entered the area and more will follow shortly. By the end of October a total of 740 lots out of 1,376 had been taken up.

In Pahang, prospects for a good harvest are quite bright. Here and there reaping has already commenced and harvesting will soon be in full swing. Operations are well advanced this season and if all goes well the crop will have been safely harvested before the December floods.

Coconuts.—Copra prices increased considerably and at the end of the month stood at about \$5 per picul, though prices as high as \$5.60 are quoted.

Work on coconut holdings is being renewed and kilns which have been out of use for a long time are being worked again.

Fruit.—The yield of bananas in Negri Sembilan in November was more than twice that for the previous two months. A heavy crop is also being harvested in Bentong and Manhis with the result that at the moment the market is glutted and prices have fallen. Banana growers in Negri Sembilan are doing a good business in supplying suckers to estates where areas of food crops are being planted. The Department has arranged the supply of some 8,000 suckers to Selangor estates from this source.

Pineapple factories were unable to work continuously during November as only a limited supply of fruit was available.

In Perak, budding of fruit trees in the field has been done by Departmental Officers on an orchard recently planted by a Malay. Out of 64 seedlings dealt with 45 had taken and had made good growth when inspected at the end of the month. In cases of this sort a charge of 25 cents is made for each seedling successfully budded by the Departmental Officer or workman. In the particular case instanced the owner of the orchard has benefited from what he has seen and has budded a number of seedlings for himself. While promiscuous budding for themselves by small-holders may not be altogether a wise thing to advocate, under circumstances such as those mentioned it is obviously a useful adjunct to the supply of budded plants from Agricultural Stations in effecting improvement in the quality of fruit grown in small holdings. It is reported that in the Krian and North Circles of Perak much interest in budding has been evinced recently; there is a keen demand for budded plants from Selama Agricultural Station as well as requests from small-holders for the budding of seedlings growing on their lands.

Penang Hill Land.

The work of examining and gazetting areas in Penang as "hill land" in accordance with the Hill Lands Ordinance is proceeding. The second lot of hill land areas has now been gazetted; 43 out of 104 cultivators in this area will have to cease short term cultivation. Every endeavour is being made to find alternative flat land for squatters who, as a result of the operation of this Ordinance, will be prevented from continuing cultivation.

Pig Breeding Station, Malacca.

A suitable location for the new Pig-Breeding Station has now been selected. The site is 3 acres in extent and is situated just outside Malacca town near the Pulau Gadong Padi Experiment Station. It is easy of access and while being well placed as regards the local Chinese pig-breeders, it will not be objectionable to the local Malay population.

During the month work on preparing the site and erecting building and fencing has gone forward. Progress has been delayed owing to the difficulty in obtaining supplies of building materials.

It is hoped shortly to make a start with 2 gilts from the Agricultural Station, Province Wellesley, and a boar from Cameron Highlands.

Giant Snails.

The following is an extract from a report by the Agricultural Assistant, Pasir Puteh, Kelantan:—

“Several peasants from the inland who had never seen these snails came to Cherang Ruku and took some specimens for the purpose of breeding them, saying that they looked very beautiful!”

FERTILIZER PRICES, DECEMBER, 1939.

The following are the prices current for the month of December, 1939, of some of the more important fertilizers.

Product.		Analysis				Price per ton \$
		Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
			Soluble	Insoluble		
Sulphate of Ammonia	...	20.6	—	—	—	86.00
Calcium Cyanamide	...	20.6	—	—	—	120.00
Muriate of Potash	...	—	—	—	50	144.00
Sulphate of Potash	...	—	—	—	48	120.00
Superphosphate (concentrated)	...	—	39	—	—	120.00
Superphosphate	...	—	16-18	—	—	65.00
Basic Slag	...	—	16*	—	—	66.00
Rock Phosphate (Christmas Island)	...	—	11*	38‡	—	33.50¶
Rock Phosphate (very finely ground Gafsa)	...	—	11*	26 - 28‡	—	40.00
Lime	...	—	—	—	—	20.00

* Citric soluble.

‡ Total

¶ \$31.50 per ton *ex* warehouse, Singapore.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

Statistical. **MARKET PRICES.**

November 1939.

Major Crops.

Rubber.—The market was again notable for considerable fluctuation in quotations and also for a substantial improvement in values. No. 1. X. Ribbed Smoked Sheet opened in Singapore at 38 $\frac{3}{4}$ cents per lb., weakened to 37 $\frac{3}{4}$ cents on the 3rd November, and rose to 39 $\frac{1}{4}$ cents on the 11th; it then fell again to 38 $\frac{1}{4}$ cents on the 17th, improved steadily to 40 $\frac{3}{4}$ cents on the 25th, weakening once more to close at 39 cents.

The average of daily quotations for the month was 39.02 cents per lb., as compared with 35.88 cents in October. The London average price was 11.25 pence per lb., and New York 20.01 cents gold, as compared with 10.16 pence and 19.68 cents gold respectively in October.

Prices paid for small-holders' rubber at three centres during the month are given in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, November, 1939.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak	Kuala Pilah, Negri Sembilan				Batu Pahat, Johore.			
	22	2	9	16	23	1	8	15	22
Smoked sheet ...	47.00	—	47.50	47.00	49.00	45.90	—	44.50	47.50
Unsmoked sheet ...	—	45.00	—	—	—	43.94	45.00	—	46.24
Scrap ...	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8 per ton.

Transport from Batu Pahat to Singapore by lorry, excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

No purchases of rubber at Kuala Kangsar on the 1st, 8th, 15th and 29th November, at Batu Pahat on the 29th, and at Kuala Pilah on the 30th November.

Palm Oil.—According to *The Oil and Colour Trades, Journal*, 3rd November, 1939, prices for materials allocated to trade consumers were announced by the Ministry of Food in the United Kingdom for the period 29th October to 25th November 1939. The prices of palm oil per ton in this list are as follows:—

£17.15 c.i.f. in casks to be returned.

£17. 5 c.i.f. in loan drums.

£16. 5 c.i.f. in bulk. (S.O.G.P.A. Contract No. 21 Allowances).

£27 refined deodorized naked *ex works*.

Local sales of palm oil (5 per cent. f.f.a.), in sellers' drums, were made in November at \$160 to \$170 per ton f.o.b. Port Swettenham and \$160 f.o.b. Singapore.

Copra.—There was a considerable improvement in the copra market during November. The sun-dried grade opened in Singapore at \$3.50 per picul and improved steadily throughout the month to close at \$4.60 on a rising market. The Singapore average price for the month was \$3.89 per picul as compared with \$3.52 in October. The mixed grade continued 30 cents per picul lower than the sun-dried grade.

Copra cake remained unchanged at \$2 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in September were as follows:—Siam No. 2 Ordinary \$4.12, Rangoon No. 1 \$4.12, Saigon No. 1 \$3.72, as compared with \$3.72, \$3.55 and \$3.25 in August, and with \$4.46, \$3.85 and \$4.10 in September 1938.

The average retail prices in cents per gantang (gallon) of No. 2 Siam rice were:—Singapore 29, Penang 30, Malacca 30, as compared with 24, 30 and 28 in August.

The average declared trade value of imports during September was \$3.81 per picul, as compared with \$3.54 in August and \$3.66 in July.

Padi.—The Government Rice Mills, Perak and Pahang, continued to pay \$2.20 per picul for padi, with a bonus of 10 cents per picul for pure strain S.K. 48 padi in the case of the Perak mills. Privately-owned mills in Kedah were reported to be paying \$2 to \$2.05.

Retail prices of padi per 100 gantangs (gallons) were as follows:—Province Wellesley and Penang \$9.45, Perak \$9 to \$12, Selangor \$10 to \$15, Pahang \$8 to \$15, Pahang \$8 to \$14, Negri Sembilan \$8 to \$10, Johore \$9 to \$16, Kelantan \$10, Labuan \$12, Brunei \$10 to \$18 (Belait \$16 to \$18).

Pineapples.—Prices of canned pineapples were again raised by the Central Board of Packers. The latest prices, per case of 48 cans of 1½ lbs. each, are as follows:—G.A.Q.: Sliced Flat \$4.80, Sliced Tall \$4.95, Cubes \$4.85; Golden: \$5.40, \$5.55 and \$5.45. Average prices for the month were:—G.A.Q.: \$4.50, \$4.65 and \$4.55; Golden: \$5.10, \$5.25 and \$5.15.

Fresh fruit prices per 100 in Selangor were 56 cents to \$1.81, and in Singapore \$2.

Beverages.

Tea.—No London prices are available.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 21st November 1939, of the Colombo Brokers' Association, are as follows, in rupee cents per lb.:—High Grown Rs. 1.13, Medium Grown Rs. 1.02, Low Grown 97.

Coffee.—Liberian coffee opened in Singapore at \$15 per picul and improved to \$16. Excelsa improved from \$10.50 to \$13.50, and Robusta rose from \$7.50 to \$8.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$11.20 to \$13.15 per picul, and for Sourabaya coffee \$13.60 to \$15.80. The October averages were \$13.19 to \$14.19 and \$10.19 to \$11.19 respectively.

Spices.

Arecanuts.—The Singapore Chamber of Commerce quotations per picul, which were stated to be approximate only, were:—Best \$5.56, Medium \$5.31, Mixed \$5.06.

The averages of the highest and lowest quotations per picul in Singapore were as follows:—Splits \$11.10 to \$13.20, Red Whole \$5.15 to \$7; Sliced \$4.95 to \$7.17, as compared with \$4.56 to \$6.62, \$5.12 to \$6.56, and \$9.19 to \$13.38 in October.

Pepper.—There was some improvement in prices during the month. Singapore Black averaged \$8.19 per picul. Singapore White rose to \$15, averaging \$14.66. Muntok White rose to \$18, averaging \$15.88. The October average prices per picul were \$8.25, \$14.25 and \$14.62 respectively.

Nutmegs.—There was no change in this market, 110's being quoted throughout the month at \$32 per picul, and 80's at \$40.

Penang dried nutmegs were sold at \$18 per picul.

Mace.—No Singapore quotations are available. Locally produced mace, dry, was sold in Penang at \$80 per picul.

Cloves.—No Singapore quotations are available. Penang cloves, dried, sold in Penang at \$55 per picul.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 27th November 1939, from Rs. 1.50 to Rs. 1.65 per lb.

Miscellaneous.

Derris.—More root was available during November and prices continued to improve. It is believed that considerable stocks are held in the main consuming countries for next year's requirements and prices may therefore ease shortly.

Average prices per picul in Singapore for November were as follows:—\$10 to \$11 for roots sold on a basis of ether extract; \$22 to \$24 for roots sold on rotenone content. The October averages were \$9 to \$10 and \$20 to \$22 per picul respectively.

Gambier.—Block was not quoted, and Cube No. 1 weakened to \$15.50, averaging \$16.25 per picul for the month.

Sago.—Prices rose again in Singapore during November. Pearl improved from \$8.25 to \$10, averaging \$9.12 per picul, and Flour, Sarawak Fair, rose from \$5.50 to \$6.50, averaging \$6.06 per picul. The October average prices were \$8.12 and \$5.81 respectively.

Tapioca.—There were further slight rises in this market in Singapore. Flake Fair rose to \$9.50, averaging \$9.12 per picul; Seed Pearl and Medium Pearl rose from \$9 to \$10, averaging \$9.50. In October all grades averaged \$8.62 per picul.

Tobacco.—In Kelantan prepared tobacco continued to be sold at the October prices: 1st quality \$85 to \$170 per picul, 2nd quality \$60 to \$135, 3rd quality \$40 to \$115. Prices of dried leaf per picul were:—Perak 1st quality \$40 to \$42, 2nd quality \$30 to \$35, 3rd quality \$12 to \$30; Negri Sembilan \$15 to \$30, \$12 to \$25, \$6 to \$15; Pahang \$20 to \$30, \$10 to \$25, \$5 to \$18. In Kedah 1st quality tobacco was \$34 to \$36. In Province Wellesley and Penang 1st quality was \$33, and 2nd quality \$23. In Selangor cut tobacco was 50 to 70 cents per kati. In Johore, cured leaf prices ranged from \$11.50 to \$48 per picul, and prepared tobacco prices from \$36 to \$144 per picul.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co. Ltd., Kuala Lumpur, local palm oil prices by Whittall & Co., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1939	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,402.5	2,726.3	5,128.8	429.7	502.0	931.7
February ...	2,193.4	1,693.3	3,886.7	372.9	282.0	654.9
March ...	2,453.1	2,324.8	4,777.9	437.9	394.0	831.9
April ...	2,160.5	2,082.2	4,242.7	423.4	346.0	769.4
May ...	2,066.0	1,760.1	3,826.1	403.1	274.1	677.2
June ...	2,204.8	2,030.2	4,235.0	368.9	318.0	686.9
July ...	2,522.8	2,360.9	4,883.7	437.0	353.0	790.0
August ...	3,613.2	3,004.2	6,617.4	680.8	554.0	1,234.8
September ...	3,260.9	1,625.8	4,886.7	651.2	276.0	927.2
October ...	2,624.5	2,062.2	4,686.7	552.4	326.0	878.4
Total ...	25,501.7	21,670.0	47,171.7	4,757.3	3,625.1	8,382.4
Total January to October, 1938 ...	24,238.3	17,761.7	42,000.0	4,258.2	2,901.0	7,159.2
Total for the year 1938 ...	28,979.0	22,087.7	51,066.7	5,158.9	3,620.0	8,778.9

Stocks on estates as at 31st October, 1939, were : palm oil 1,778 tons, palm kernels 1,675 tons.

MALAYAN RUBBER STATISTICS.

ACREAGES OF TAPTABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 31ST OCTOBER, 1939.

STATE OR TERRITORY (1)	Estimated Acres of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPTABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)			Total area not tapped (3) + (5) (c)			TOTAL AREA TAPPED DURING THE MONTH			Area of tappable rubber rested under rotational systems (c)		
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Percent- age of (7) to (2)		Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Average (13)	Percent- age of (13) to (2) (14)	Average (15)	Percent- age of (15) to (2) (16)	Average (17)	Percent- age of (17) to (2) (18)	Average (19)
		Acres (3)	Percent- age of (3) to (2) (4)	Acres (5)	Percent- age of (5) to (2) (6)	Acres (7)	Percent- age of (7) to (2) (8)										
S. S.—																	
Province Wellesley ...	42,964	559	1.3	10,754	25.0	507	1.2	11,313	26.3	73.7	8,195	19.1	31,651	73.7	8,195	19.1	19.1
Malacca ...	117,380	1,505	1.3	26,495	22.6	1,994	1.7	28,060	23.9	76.1	26,436	22.5	89,520	76.1	26,436	22.5	22.5
Penang ...	2,549	nil	nil	1,057	41.5	35	1.4	1,057	41.5	58.5	60	2.4	1,492	58.5	60	2.4	2.4
Singapore ...	31,973	4,980	15.6	8,007	25.0	275	0.9	12,987	40.6	59.4	3,303	10.3	18,986	59.4	3,303	10.3	10.3
Total S.S. ...	195,066	7,104	3.6	46,313	23.8	2,811	1.4	53,417	27.4	72.6	37,994	19.5	141,649	72.6	37,994	19.5	19.5
F. M. S.—																	
Perak ...	283,746	7,753	2.7	55,092	19.4	6,885	2.4	62,845	22.1	77.9	43,954	15.5	220,901	77.9	43,954	15.5	15.5
Selangor ...	315,241	4,711	1.5	50,604	16.0	6,763	2.1	55,315	17.5	82.5	50,267	15.9	259,926	82.5	50,267	15.9	15.9
Negri Sembilan ...	261,627	8,457	3.3	56,584	21.6	11,328	4.3	65,041	24.9	75.1	38,772	14.8	196,586	75.1	38,772	14.8	14.8
Pahang ...	85,306	3,189	3.8	19,983	23.4	4,942	5.8	23,172	27.2	72.8	8,628	10.1	62,134	72.8	8,628	10.1	10.1
Total F.M.S. ...	945,920	24,110	2.5	182,263	19.3	29,918	3.2	206,373	21.8	78.2	141,621	15.0	739,547	78.2	141,621	15.0	15.0
U. M. S.—																	
Johore ...	477,730	11,979	2.5	115,516	24.2	34,468	7.2	127,495	26.7	73.3	61,677	12.9	350,235	73.3	61,677	12.9	12.9
Kedah ...	198,950	7,854	4.0	21,184	10.6	6,220	3.1	29,038	14.6	85.4	39,290	19.7	169,922	85.4	39,290	19.7	19.7
Kelantan ...	31,235	403	1.3	6,802	21.8	2,196	7.0	7,205	23.1	76.9	5,418	17.3	24,030	76.9	5,418	17.3	17.3
Trengganu (d) ...	4,817	nil	nil	40	0.8	nil	nil	40	0.8	99.2	2,301	47.8	4,777	99.2	2,301	47.8	47.8
Perlis (e) ...	1,459	335	23.0	271	18.5	147	10.1	606	41.5	58.5	224	15.4	853	58.5	224	15.4	15.4
Brunei ...	5,980	nil	nil	1,625	27.2	260	4.3	1,625	27.2	72.8	1,324	22.1	4,355	72.8	1,324	22.1	22.1
Total U.M.S. ...	720,181	20,571	2.9	145,438	20.2	43,291	6.0	166,009	23.1	76.9	110,234	15.3	554,172	76.9	110,234	15.3	15.3
Total MALAYA ...	1,861,167	51,785	2.8	374,014	20.1	76,020	4.1	425,799	22.9	77.1	289,849	15.6	1,435,368	77.1	289,849	15.6	15.6

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore columns (11) and (12) include columns (13) and (14) respectively.

(d) Registered companies only.

(e) Figures for the quarter ending 30th September, 1939.

MALAYAN RUBBER STATISTICS Table I.
ACREAGE, STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX.
FOR THE MONTH OF OCTOBER, 1939, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over			Production by Estates of less than 100 acres estimated 2			Imports				Exports including re-exports				Stocks at end of month			Consumption 3
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Oct. 1939	during the month	Jan. to Oct. 1939	during the month		January to Oct. 1939		during the month		January to Oct. 1939		Ports	Dealers	Estates of 100 acres and over			
								Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local						
MALAY STATES :—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Federated Malay States	...	5,916	23,368	12,574	101,881	8,298	47,503	Nil	Nil	Nil	Nil	19,715	5,337	121,438	34,609	...	5,423	19,663	18	182	
Johore	...	2,833	7,993	5,533	44,542	5,762	31,187	Nil	74	Nil	559	3,646	9,175	27,056	52,041	...	2,307	7,067	...	...
Kedah	...	490	4,913	2,894	23,302	1,561	8,010	Nil	Nil	Nil	Nil	2,104	2,923	15,369	18,946	...	361	4,470	...	...
Perlis	...	11	17	21	111	46	215	Nil	Nil	Nil	Nil	Nil	46	Nil	320	...	27	22	...	...
Kelantan	...	359	662	380	3,272	1,325	6,190	Nil	Nil	Nil	Nil	162	1,463	2,560	6,889	...	505	596	...	...
Trengganu	...	43	293	156	1,363	409	2,363	Nil	Nil	Nil	Nil	Nil	599	Nil	3,764	...	33	269	...	...
Brunei	...	Nil	72	61	412	79	576	...	...	...	...	...	113	Nil	989	...	14	85	...	...
Total Malay States	...	9,652	37,318	21,619	176,883	17,480	96,044	Nil	74	Nil	559	25,627	19,656	166,323	117,558	...	8,670	32,172	18	182	
S. SETTLEMENTS :—	
Malacca	...	1,619	1,886	1,196	9,540	893	5,379	Nil	Nil	Nil	Nil	3,194	...	22,018	...	...	1,786	1,752	...	...
Province Wellesley	...	1,084	974	504	3,867	228	1,654	Nil	Nil	Nil	Nil	9,014	...	62,252	...	...	671	951	...	...
Penang	...	2,137	2,071	13	17	163	690	1,731	22,189	24,454	116,278	...	...	...	...	...	1,562	2,144	15	...
Singapore	...	6,960	12,314	198	151	1,098	84	559	19,694	130,741	116,278	33,004	...	211,887	...	...	6,030	15,662	231	18
Labuan	...	11	Nil	Nil	Nil	22	99	68	...	520	...	Nil	...	Nil	16	Nil	...	245
Total Straits Settlements	...	9,097	17,099	3,071	1,868	1,316	8,381	21,493	22,189	155,715	116,278	45,212	Nil	296,157	Nil	...	7,592	20,279	2,949	18	245
Total Malaya	...	9,997	26,751	40,389	23,487	18,796	104,425	21,493	22,263	155,715	116,837	70,839	19,656	462,480	117,558	...	7,592	28,949	35,121	36	427

TABLE II
DEALERS' STOCKS IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	4,488	14,732	1,794	2,208	1,967	199
WET RUBBER	940	930	350	279	340	162
TOTAL	5,423	15,662	2,144	2,487	2,307	361

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Oct. 1939
29	30	31
Singapore	50,542	319,277
Penang	14,000	96,159
Port Swettenham	6,297	46,100
Malacca	Nil	944
MALAYA	70,839	463,480

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Oct. 1939
32	33	34
Malay States	...	45,198
Straits Settlements	...	23,719
MALAYA	...	48,765

- Notes:—**
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e., Column [15] + Column [16] + [17] + [18] + [19] + [20] = [21] — [22] [23] — [24] — [25] — [26] — [27] — [28] — [29] — [30] — [31] — [32] — [33] — [34] — [35] — [36] — [37] — [38] — [39] — [40]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by census paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40% stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are re-estimated by sales or exports as shown by census paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th November, 1939.

METEOROLOGICAL SUMMARY, MALAYA, OCTOBER, 1939.

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT					EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.					
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total.	Most in a day.	Precipitation .01 in or more	Thunderstorm	Fog morning obs.	Gale force 8 or more	Total.	Daily Mean.	Per cent	
	A.	B.		Highest	Lowest	Min.	Max.												
	Max.	Min.	°F	°F	°F	°F	°F	°F	in.	mm.	in.	mm.	in.	mm.	in.	mm.	hrs.	hrs.	Per cent
Railway Hill, Kuala Lumpur, Selangor	88.1	72.2	80.1	92	69	83	75	83.0	83.9	239.8	1.28	22	18	6	5	—	129.55	4.18	35
Bukit Jeram, Selangor†	87.5	72.6	80.1	92	69	82	76	84.1	85.3	195.1	2.48	18	13	1	1	—	150.70	4.86	40
Port Swettenham, Selangor	87.1	73.0	80.1	91	70	78	75	83.5	84.5	221.5	1.94	21	21	2	—	—	165.10	5.33	44
Sitiawan, Perak	88.3	72.5	80.4	91	70	81	75	82.5	83.5	198.6	1.79	22	20	3	—	1	161.05	5.19	43
Ipoh Aerodrome, Perak	88.2	72.4	80.3	93	69	85	75	84.6	86.2	203.2	2.11	21	19	—	7	—	157.15	5.07	42
Temerloh, Pahang	88.2	71.3	79.7	91	69	85	73	82.0	84.0	429.3	2.81	23	23	6	29	2	147.85	4.77	40
Kuala Lipis, Pahang	85.9	73.3	79.6	88	71	81	76	83.5	85.9	355.3	3.98	19	17	2	—	1	170.25	5.49	45
Kuala Pahang, Pahang	85.0	75.1	80.1	88	72	80	79	82.3	83.3	274.3	1.92	23	18	5	—	1	139.95	4.51	37
Kallang Aerodrome, S'pore	84.8	73.7	79.3	88	70	75	77	82.4	83.8	548.1	4.56	24	20	3	—	—	144.25	4.65	39
Bayan Lepas Aerodrome Penang	83.9	73.7	78.8	86	72	79	77	82.0	83.9	476.5	4.33	20	18	5	1	2	159.70	5.15	43
Malacca Town, Malacca	86.8	71.2	79.0	91	69	80	73	81.4	82.2	209.3	2.00	21	18	8	—	—	119.35	3.85	32
Kluang, Johore	86.4	72.0	79.2	90	70	80	75	82.1	82.6	331.0	2.85	20	17	3	—	1	139.35	4.49	37
Mersing, Johore	85.9	73.5	79.7	91	71	76	76	83.9	84.9	303.3	2.76	28	24	2	1	1	168.50	5.43	45
Alor Star, Kedah	87.6	73.0	80.3	90	71	82	75	84.3	85.1	133.9	0.87	19	15	1	1	—	190.15	6.13	51
Kota Bharu, Kelantan	87.0	72.5	79.7	89	70	81	74	82.6	84.8	326.1	2.33	24	20	13	—	2	202.05	6.52	54
Kuala Trengganu, Trengganu	85.8	75.8	80.8	88	73	82	79	83.0	84.9	472.9	2.83	22	17	2	—	—	216.60	6.99	58
Labuan	73.7	62.1	67.9	77	59	70	64	72.1	72.3	255.5	1.91	25	22	3	11	—	122.55	3.95	33
HILL STATIONS.	71.8	57.7	64.7	75	55	68	62	70.4	70.1	345.2	2.33	30	26	1	3	2	109.80	3.54	29
Fraser's Hill, Pahang 4268 ft	71.3	59.0	65.1	75	57	66	61	*	*	348.7	2.12	29	22	—	—	2	111.25	3.59	30
Cameron Highlands, Tanah Rata, Pahang 4750 ft.																			
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft.																			

* Not recorded.

† Station closed on 15th August, 1939.

